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VIEWS, NEWS AND INTERVIEWS.

The sad death of Instructor Merriam and Miss Yeargin, of Cornell University, who were drowned in Cayuga Lake on November 18, has cast quite a gloom over prospective pleasure seekers on the lake.

The portion of the lake where they were supposed to have gone down has been well dragged by old fishermen, but to no avail. It has been the saying there that people who are drowned in the deep waters of blue Cayuga are never seen again, and it is feared that the two young people will be added to the list of missing forever. The charts of the lake in the civil engineer's department at the University show the middle of the lake to be similar to a deep gorge, the bottom consisting of projecting ledges, and at some points it has never been found.

It has been decided to utilize electricity in the search for the bodies, the plan being to submerge an incandescent light of sufficient power to illuminate the water and reveal objects at the bottom of the lake. Several electricians have interested themselves in the project, and it is expected that the work will be begun immediately. A dynamo from the University and an engine will be placed in a steam launch and operated in connection with the boiler of that craft. A. E. Dresser, manager of the electric company, of Syracuse, and Burton S. Lanphear, of the University, will assist in the work. Much interest attaches to the experiments, and the results will be eagerly awaited.

Trees are felled by electricity in the great forests of Galicia. For cutting comparatively soft woods, the tool is in the form of an auger, which is mounted on a carriage, and is moved to and fro and revolved at the same time by a small electric motor. As the cut deepens, wedges are inserted to prevent the rift from closing, and when the tree is nearly cut through, an ax or hand-saw is used to finish the work. In this way trees are felled very rapidly and with very little labor.

A singular attribute of massage is noticed by Dr. A. Symons Eccles, who has discovered that it indisputably decreases in a marked degree the resistance of the skin to the passage of electrical currents. In this way the number of cells necessary in order to pass a given quantity of current through the skin, in cataphoric and other treatment, can be reduced, and a great economy of electricity effected. Dr. Eccles suggests that where the alternating constant current is used for the purpose of percutaneous medication by saturating the electrodes with a watery solution of the substance selected for use, the effectiveness of the application will be materially increased by preliminary massage; the drug will be more rapidly absorbed just as surely as the resistance of the tissues to the passage of the electric current will be reduced. The science of cataphoresis, or the driving into the tissues by the application of electric currents of drugs or medicines, by which many injured parts can be treated that otherwise could not be reached, is now largely brought into requisition both in hospital and private medical practice, and Dr. Eccles's discovery is likely to greatly increase its efficiency.

Judge Townsend of the United States Circuit Court, has rendered a further decision in the suit in which the same Court recently rendered a judgment, sustaining the validity of the patents covering the Westinghouse system of quick action air brakes. This last decision denies the motion of the defendant, the New York Air Brake Company, for leave to sell, subject to a royalty, three thousand sets of infringing air brakes which they claim to have on hand, and makes the injunction in favor of the Westinghouse Company absolute.

The Smith's Falls, Province of Ontario, Electric Power Company, Limited, capital, $60,000, have now completed the erection of their power house, situated at the south-east end of the town, on the Rideau River, on probably the best water power on the "Rideau," between Kingston and Ottawa, giving at lowest water in the year fully 1,000 horse-power, and as high as 2,000 horse-power at other times. The power company are furnishing the Smith's Falls Electric Light Company with power for both arc and incandescent systems, as well as supplying power by electricity for the foundries of the Trojan Car Coupler Company, of Troy, N. Y.; the Malleable Iron Works; and the large agricultural implement works of Frost & Wood. As Smith's Falls has the best of railway connection, and river connection as well, by way of the St. Lawrence, at Kingston and Ottawa, on the Ottawa river, American manufacturers having any intention of establishing Canadian branches of their manufacturing works would do well to write to the secretary of the Board of Trade of Smith's Falls for any information desired, or to the power company for rates for power.

FIG. 1.—"MIGNON" TELEPHONE SET.

A New Telephone Set.

Among the constantly increasing number of new telephone sets adapted for use in hotels or large manufacturing establishments, the device recently patented in Germany by Messrs. Hammacher and Paetzold, of Berlin, is interesting, both on account of the compactness of its several component parts, and the simplicity of the entire apparatus. The above mentioned firm which makes the manufacture of house and factory telephone sets a specialty, constructs two distinct types of instrument. The first type, called "Mignon," Fig. 1, is now very widely used in Germany, and consists of a small, square, wooden box, containing the alarm bell, transmitter induction coil and automatic commutating switch. The transmitter, as in the Blake instrument, is attached to the cover of the box, while a telephone, shaped like a round pill box, is carried on the hook. It will be noticed that all connections are made in the most simple and substantial manner, avoiding scrupulously all connecting wires.

The "universal commutator," another device manufactured by Messrs. Hammacher and Paetzold, is clearly shown in Fig. 2. The principle of avoiding all wire connections is strictly adhered to, and it is evident that this switch may readily be enlarged to be used in connection with a large number of sub-stations. According to exhaustive tests made at the Imperial Physico-Technical Laboratory of Charlottenburg, the transmitter possesses great carrying power, but requires only one-fourth of the amount of current necessary for the satisfactory operation of ordinary transmitters.

THE POWER HOUSE MAN.

Half a Day with a Progressive Chief Engineer.

A PHILOSOPHER OF THE "REVIEW" STAFF PENETRATES INTO THE INNER CIRCLE OF THE POWER HOUSE SENTIMENT—DRAUGHTS IN THE STATION—ELECTRIC CRANES THE PROPER THING—SHUT OFF STEAM FIRST IN CASE OF ACCIDENT—EVERY HEAT UNIT IN DEMAND.

How the other half lives has always been a question which has interested, to a great extent, those who have concerned themselves with affairs pertaining to the social conditions of the inhabitants of this earth, and to questions of political and domestic economy. In many cases things are so arranged that it matters little whether or not we are aware of the condition of the other half. We eat, drink, and in short, live, and it is mostly but our own social condition which confronts us.

On a pleasure jaunt across the ocean we take little heed of the sufferings of the stokers in the hold of the ocean greyhounds. In short, the passengers on any system of transit, rapid or otherwise, have little thought for those who control the machinery, whether it be beneath the waves or above the ground.

In the case of steam locomotive engineers we have visible evidence of the trials they have to undergo, and often too they are most arduous. In the case, however, of electrical railways, the man who tends the whirring wheels does his work silently and unostentatiously, with little care for the appreciation of those who rely on him for their transition from place to place within city limits. The engineer at the power house has little in common with the traveling locomotive engineer; his work is practically as different from the latter's as is that of a stationary engine from that of a locomotive.

A man high in social circles, who had by some means or other secured control of a large power plant, upon being told that the engineer's duties were onerous, replied, "Why, what has he got to do besides watching the machine move and oiling it once in a while?" If any one believes for a moment that this is the condition of affairs that exist in a power house, he is sadly mistaken. It

is a constant strain on the engineer's attention, for he must continually be on the lookout.

Several years ago the pay of an assistant engineer used to be about $40 per week, but with the increasing needs for assistant engineers, there arose in due time men who competed for positions, until now the salary which can be earned by such an individual is not more than $25 a week. With the increased systematizing, however, the responsibility does not fall so much on the assistant engineer's shoulders as on those of the chief engineer, while even below the assistant engineers in a power house may be placed the oilers and firemen.

To get an idea of the duties devolving upon these employés, let us see exactly of what their work consists. The fireman working in eight hour shifts will, in many power houses, supply his particular boiler with from 7,000 to 10,000 pounds of coal in the eight hours. Of course, this is not a fixed sum and the amounts vary, but we can form from these figures a slight estimate of the amount of back bending necessary to supply the capacious mouths of these furnaces. But we will reserve the firemen for some future time, and briefly mention the duties of the other station house attendants.

Approaching one of the assistant engineers in a large power house recently constructed, I asked him how he was pleased with the work. At first he seemed to think that my question was what might be called not a pertinent one and he seemed to resent the inquiry. Evidently, thought I, he must have been bothered by something that occurred recently, so I presumed that my question had been a little too direct and proceeded to duly beat around the bush.

"Pretty draughty place," I suggested. I had struck a tender point; he had a bad cold, so had I, so upon the supposition that "Fellow feeling makes us wondrous kind," he seemed to thaw out slightly and was less reticent than before.

"Well," said he, "if you had to stay in a draughty place like this from seven in the morning until 11 at night, practically spending your whole time in this one room, cold in Winter and hot in Summer, you would think it very likely that colds would be more numerous."

"Your hours are very long," I suggested.

"Long is not the word for it," he answered. "There is no end to them, for we are expected to be on duty all the time. Since I have been assistant engineer here, it has been expected of me that I be at my post at any moment. With this condition of affairs you can readily see that we don't have much chance for amusement."

For a progressive and aspiring man this employment, which is practically an imprisonment, must be very galling.

"But," said he, very philosophically, "I intend to make the best of things here, I am learning every day, and I suppose I have to pay for my experience." Thus, it could be seen how contented he was with his lot. Pointing to one of the huge traveling cranes, he said, "What do you think of a power station supplying electricity to hundreds of horse cars, and not having this traveling crane propelled by electricity? Watch those men," and he pointed to four or five workmen who were violently pulling at a pulley chain which enabled them to lift the cylinder head of an engine. The engineer looked at the men rather cynically for a few moments, and then said, "This railway company seems to supplant the horse with the trolley, but in a power house the workman goes straight ahead and does work that could be much easier performed by an electrically controlled motor." He shrugged his shoulders, "That is what I call a narrow-sighted policy in little things," he exclaimed.

Evidently this man was dissatisfied at something, and it was not difficult to determine that he had done something that had given rise to a complaint, and the chief engineer had spoken to him in terms other than those of affection. He was suffering from the want of that glorious feeling of independence, and it could be readily seen that he galled under the restraint.

With the chief engineer, however, matters are different. His word is law and, of course, he being the authority, everything is referred to him. He must be a man of erudition, careful, precise, systematic, and above all, a man equal to any emergency that may occur. His responsibilities are heavy, and he must have the management of the station so well under his control that no matter what happens he is at once as fully cognizant of the details as if he had been studying up the subject all his life, which, indeed, he must have to procure his position.

The quality of being equal to any emergency, or what is more commonly termed, cool headed, must be possessed by him in the highest degree. Like the captain of the ship, the smallest details, as well as the matters of vital importance, must be perfectly comprehended by him, and, in a measure, their responsibilities are the same. An accident, however, in a power station does not endanger human lives, as would one on an ocean steamship. As a rule, it is generally difficult to obtain much information from these engineers in chief, but once in a while an affable one is found and it is a pleasure to converse with him. Being thoroughly conversant with his subject, information received from him is of the utmost value.

"What do you do," I asked, "in case an accident happens?"

"Well," he replied, "there is only one thing ever to do, and that is to shut off your steam as quick as possible."

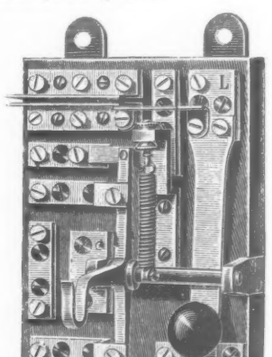

FIG. 2.—UNIVERSAL TELEPHONE COMMUTATOR.—SEE FIRST PAGE.

This seems like very simple advice, and is a fact well known to all engineers.

"Are you not all the time afraid of accidents?" I asked.

"No," he replied, "while I am always ready to meet them, if I were to think that accidents were always going to occur, I would be a most miserable man, and I am not living on this earth to be miserable. I simply pursue the even tenor of my way, and when anything happens I always thank the Lord it is nothing worse. In other words, I believe in taking hold of a tool by the smooth handle. Our work is never ended, but we have our health and a prospect before us of some day being able to retire and live a regular easy life."

Machinery is constructed now-a-days, thanks to a perfect designing and workmanship, so that very little trouble is caused by them. Now and then an imperfect machine is constructed, but this is the exception.

"What is your opinion about the improvements which can be made in electrical and steam engineering?" I asked.

"There are very few things to be done," he replied, "but the changes are radical ones. Losses of all kinds must be done away with; in short, we must get the use of every heat unit that comes from our coal. Of course, these cities which are provided with water power should consider themselves blessed, but seaport and other towns not provided with water power must be satisfied with the generation of their power by steam. As far as I can see now," he continued, "machinery of very much different construction must be built before we have increased efficiencies, but when they do come, it's going to be a sorry day for the workmen and a gala occasion for the manufacturer and capitalist. I expect, however, that it will be in the very near future before the improvements will be so noticeable as to almost permit of their being called radical changes."

JULIAN A. MOSES.

Final Decision in the Hydrocarbon Suit.

We give below copy of the decision of the United States Circuit Court of Appeals for the Third Circuit, dismissing the appeal of the United States Electric Lighting Company against the Edison Company, in what is known as the hydrocarbon suit. It is a final victory for the Edison Company.

The history of this case, as given below by the Edison people, is interesting: It was depended upon to shut off the Edison Company from using a process which they had employed under the conviction that it had fallen into the public domain. Several patents were taken out by Maxim and Edison, more or less involving the deposition of carbon from an atmosphere of hydrocarbon gases, and these were introduced by the defendants as part of their case.

As early as 1878, Sawyer and Man, more than three years before the application for the patent in suit, treated the carbon rods of incandescent lamps which they were making experimentally, by electrically heating them in both hydrocarbon gases and hydrocarbon oils, and used the carbons so treated in these incandescent lamps, and this process was continuously used by them from that time on, although they did not succeed in making commercial lamps, because of their failure to employ a filament in a sufficiently high and stable vacuum. The process of treating the carbons was described and patented by Sawyer and Man in patent No. 211,262, July 7, 1879; and, as much as a year before, both lamps and process were publicly exhibited and described in cotemporary publications.

The process is now carried on automatically, the carbon filaments in the gas being brought to a white heat by the current, and each one cut out as soon as the point of uniform resistance is reached. It is an exquisite example of nature doing her own beautiful work. It was shown that Professor Weston's efforts to claim priority of invention could not be sustained, and that the date of his first application, May 27, 1881, and of the patent, October 21, 1884, and the incorporation in both of knowledge which Sawyer and Man had made public as long as three years previously, precluded the possibility of his being the first inventor.

The case was ably argued by G. H. Christie, for the appellants, and by F. H. Betts, for the defendants. The decision follows:

United States Circuit Court of Appeals, Third Circuit.—The United States Electric Lighting Company, *Appellant, vs.* The Edison Lamp Company.

Appeal from the Circuit Court of the United States for the District of New Jersey. Before: Dallas, Circuit Judge, and Butler, District Judge.

Dallas, J.—

This suit was brought for alleged infringement of letters patent of the United States No. 306,980, dated October 21, 1884, granted to Edward Weston, for "process of making incandescents." The claim is as follows:

"The improvement in the art of making carbon conductors for incandescent lamps, which consists in first forming a carbon core for base and then building up said core with carbon obtained and deposited upon the same by and during the operation of electrically heating said core while surrounded by or saturated with a carbonaceous substance, substantially as hereinbefore set forth."

The assignments of error raise no material and substantial question which was not fully investigated and rightly decided by the court below. The learned judge of that court deemed it necessary to consider only: First, the prior letters patent of the United States No. 211,262, for the same invention, dated January 7, 1879, granted to William E. Sawyer and Albon Man, upon an application filed October 15, 1878." (The application for the Weston patent in suit was filed on May 27, 1881); "and Second, the alleged public use of the invention by Sawyer and Man and those acting under them for more than two years before Weston's application for a patent." The evidence bearing upon these matters is reviewed and properly dealt with in the opinion of the Circuit Court, and the conclusions there reached are that the proofs as a whole do not satisfactorily show that Weston's alleged invention preceded that of Sawyer and Man; and that the defense of two years' prior public use of the invention before the application for the patent in suit was impregnably established. No purpose would be subserved by again discussing this evidence. It is enough to say that our own examination of this record has entirely convinced us that the action of the Circuit Court in dismissing the bill was based upon a true apprehension of the facts and a correct conception of the law.

The decree of the Circuit Court is affirmed with costs.

The Link Between Electricity and Magnetism.

Mr. Sydney F. Walker, in a series of dissertations on "What Is Electricity?" published in the London *Electrical Engineer*, takes up the connection between electricity and magnetism. He states that the results obtained by the development of magnetism are in nearly every case totally unlike those obtained from the generation of electricity, except when bodies possessing the one form of energy are used to generate the other form—in other bodies—and yet each may be used to generate the other, and may be transformed into the other at will. What, then, is the connection between the two forces? Prof. Ewing very properly lays the greatest stress on the fact which he has discovered, that in the phenomena known as hysteresis, energy is actually consumed—so far as energy can be consumed—in the act of turning the molecules to and fro upon their several axes. That is to say, energy imparted to the molecules by the electric currents passing in the magnetizing coils is first transformed into mechanical energy, and then into heat. But this, in the writer's opinion, furnishes the clue to the connecting link that we are seeking—the link joining the two forces.

In order to grasp the idea that the writer has formed on the subject, it will be necessary to make a somewhat bold, but, he believes, a grand conception. When the atoms of what we know as our earth, the planets, our sun, and the other heavenly bodies, were passing from the gaseous or nebulous state to the solid, each group of atoms combined in some particular manner, forming themselves into certain substances, according to the conditions surrounding each group and the forces acting upon them, and so the different chemical elements, with their different properties, came into existence. These properties would depend apparently on two things, the quantity of energy absorbed in each group of atoms, and the manner in which the energy was stored. This last, the manner in which the energy is stored, the writer takes to be simply the rate and form of the vibrations of which the energy stored in each element is composed. Thus, in the substance we know as zinc, the energy stored will consist of molecular vibrations at a certain rate, and in a certain manner, the molecules covering a certain path. In iron, the energy stored will consist of vibrations at a different rate from that of zinc, and again with a totally different path for their motion. In copper, again, the motion would appear to be at a different rate from that of zinc and of iron, and with a path differing from either, but more like that of zinc than that of iron. It follows, if the above be correct, that what we know as chemical affinities are really only such affinities of vibration as we are familiar with in the case of sound.

As every student of acoustics knows, columns of air, say, enclosed in long jars, will only respond to particular notes that are communicated to them; to all others they are apparently dumb. So it would seem that when we say that zinc or iron has a strong affinity for oxygen, we merely mean that the periods of their vibrations—and the paths which their individual molecules take—are such as will readily coalesce to form what we call another substance, but which, if the motions were larger and those of bodies that we could see, we should call taking the form and the period of the resultants of the two motions.

Amongst other points, it may be noted that each substance, however simple, or however complex, has the property of selecting what portion of heat or light rays it will absorb and what portion it will reject, the latter portion determining by what color, as we term it, the substance shall be known to the human eye. Of course, we know that by color we merely mean that the rays of light reaching our eye from a given body are vibrating at a certain rate. But it would appear that this question of colors, like that of chemical affinity, and like that of columns of air, stretched wires, etc., is merely a

question of the rates and the forms of vibration of the body upon which the light rays fall, and such of those of the light rays themselves as are able to coalesce, and that the color and form assumed by the body is due to the resultant of these vibrations to the resultant rate and path taken by the molecules of the body. Color contrasts and some of the well-known optical delusions well illustrate this. Among the numerous forms taken by different groups of atoms and their numerous properties, iron and its alloys, with cobalt and nickel, appear to have conferred upon them the peculiar property we know as magnetism, viz., the property of being double-ended, the two ends having opposite qualities, and the property of dissimilar ends attracting each other. This the writer conceives to be stored energy in the form of a vibration of a special time and form peculiar only to those bodies, iron, nickel and cobalt, but more especially to iron. Oxygen, as we know, possesses magnetic properties in a very small degree, and it is a striking fact that one form of oxide of iron, Fe_3O_4, also possesses this same property, while the other compounds that iron forms with oxygen and with other elements do not. The writer interprets this fact thus: The molecules of the iron when pure, or when alloyed, are in a state of vibration at the special rate and in the special manner which gives rise to polarity and attraction between dissimilar poles. When combined with a certain quantity of oxygen, that contained in the magnetic oxide, the resultant rate and form is sufficiently near to that of the iron itself to enable the molecules to respond to the force exerted by other magnets, though not so readily as iron would. When other proportions of oxygen or other elements are combined with the iron, the rate and form of the vibrations are so altered that they do not respond to the vibrations emitted by magnets, and have lost the magnetic properties. It appears to the writer that it is probable that magnetic vibrations within any magnet, or within any molecule of any magnet, are in the form of continuous waves from one end to the other, these waves being taken up by the ether surrounding the magnet or the molecule, and from it communicated to the next molecule, or to another magnet or another piece of iron, as a pushing or pulling force—what we call lines of force being merely the communication by the ether of this pushing or pulling force—the ether itself, of course, vibrating in unison with the magnet or the molecule it proceeds from.

Then as to how electricity is connected with magnetism. If Professor Ewing's theory of magnetism is correct—and, as we know, it answers for all known phenomena—if we impart energy, or, in other words, molecular vibrations to the molecules of an iron bar, in a suitable manner, in a manner that they can accept, they are obliged to release themselves from their previous attractions for other molecules, turn themselves round in a particular manner, and send off their lines of force, their pushing and pulling forces, in front of and behind them. What takes place is, in the writer's view, the molecules of iron take up a position which is due to the resultant of the two sets of vibrations—those present in the molecules before the act of magnetization, and those impressed by the electric current; both, of course, being modified by the vibrations of surrounding bodies. What the electric current does, apparently, is to communicate this energy to the molecules of iron, nickel or cobalt, just in the form in which it will do that particular work within the bar, viz., the twisting of these molecules and the sending out of their pushing and pulling forces into the ether surrounding. The rate and form of vibration imparted by heat, as we know, not only will not effect this, but will actually extinguish the magnetism when already created, the resultant rate and form of the vibrations being evidently such as will not respond to the magnetic pushing and pulling forces.

We do not know whether the form of energy we know as sound can be converted into magnetic energy. Probably it can, but only after first being transformed into some other form. From mechanical energy in the form of impact, as we know, we can obtain a slight degree of magnetization; but it is electricity that gives us the best results, because, apparently, its rate and form of vibrations are so allied to those impressed upon the molecules of the iron at their birth, that the resultants of the two create the pushing and pulling forces we know as magnetic repulsion and attraction.

But how does the electric current do this? The writer has not yet dealt at length with the phenomena of electrical conduction in this series of articles, but it may be stated shortly that his view is that what we call conduction is merely the transmission of the vibration he conceives electricity to be, continuously through the mass of the conductor, and electro-magnetism he conceives to be its transmission in waves surrounding the conductor. As he understands the matter, the transmission within the conductor is only a part of another wave, the difference being

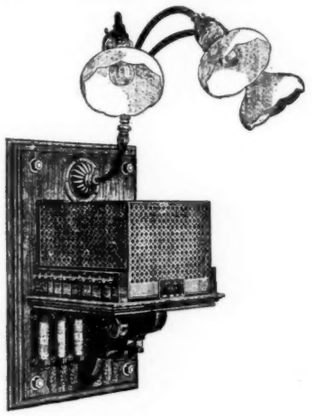

FIG. 1.—PHASE INDICATOR IN USE AT ERDING, GERMANY, MUNICIPAL STATION.

that the wave within the conductor proceeds onwards at a very different rate to the waves surrounding the conductor, while the waves surrounding the conductor and emanating from it are influenced by the rate and form of the vibrations already present in the molecules surrounding the conductor.

Given, then, a conductor, with a current passing through it, and a piece of iron in its neighborhood, it will be remembered that the iron, if it is to be properly magnetized, must occupy a certain position with reference to the conductor. Waves of vibrations emanate from the conductor, circling round it in larger and larger circles, and on arrival at the iron, impress upon its molecules some of the energy of which they are possessed, and gradually as the molecules become possessed of more and more energy, more and more vibrations—now at a different rate and of a different form to that with which they were created—obliging them to turn round on their axes and to send out the push and pull vibrations already referred to, or, as we say, to become magnetic.

A Request for Employment.

TO THE EDITOR OF ELECTRICAL REVIEW:

I would like to obtain a situation with some electrical company, at wiring (for bells, etc.), where I could work myself up from the position of lineman to that of electrician.

I am not altogether without knowledge on the subject, having studied it for some time as an amateur.

Would you, through the columns of your esteemed paper, kindly advise me?

Respectfully yours,

A. E. KOEHLER.

New York, November 28.

[The ELECTRICAL REVIEW is in receipt of a great many letters similar to the above. The only advice we can give is that young men seeking work in the electrical field should make diligent inquiry in person or by correspondence among the electric lighting, electric railway and electric manufacturing companies in their vicinity. This supplemented by a small card, if they can afford it, in the electrical papers, will get their names before the field which they wish to enter.—ED. ELECTRICAL REVIEW.]

A Phase Indicator and a Lightning Arrester.

In an article in London *Electricity*, on the municipal central station installed at Erding, Upper Bavaria, by Siemens & Halske, the phase indicator and lightning arrester, illustrated herewith, are described. The phase indicator is shown in Fig. 1 and consists of two small multiphase-current transformers, whose primaries are connected to the corresponding dynamo leads, while the secondaries of both are connected to each other in such a way that, when the machines are synchronous, the potentials in the secondaries balance each other. A control of the mutual effects of the two machines is obtained by connecting three glow lamps to three secondary circuits, which, in case of a synchronous working, flare up at one moment and go out the next, while, in case of synchronous working, they burn with a steady light, the intensity of which depends on the displacement of phase of the electromotive force of both machines. The two voltmeters, on the other hand, are connected to the secondary windings of the two transformers of the phase indicator in such a way that they indicate permanently the secondary electro-motive force produced by the current transformation, and thus permit of a control of the primary electro-motive force as well. The wires leading to the voltmeters pass, in the first instance, through two three-polar switches, and then only to the voltmeters, by means of which the secondary electro-motive force between any two lines can be measured at any time. On the high-pressure wires leading to the phase indicator three additional tinfoil safety fuses are inserted, constructed in a manner similar to that of the dynamo safety fuses.

As a protection against lightning a barbed wire starting from the lightning conductor of the central station is run above the wires all along the line and led to earth at every fifth pole. A few convolutions of barbed wire are also would round the other poles, so as to prevent as much as possible people from climbing them. As a further protection against lightning, a special lightning arrester with automatic spark extinction is

FIG. 2.—LIGHTNING ARRESTER IN USE AT ERDING, GERMANY, MUNICIPAL STATION.

connected to each of the three wires at a spot about midway between the two extremities of the overhead line. These lightning arresters (Fig. 2) consist chiefly of carbon plates placed opposite each other at a certain distance. The upper plate is carried by an iron core, movable within an insulated copper coil. This coil, on the one hand, is earthed, being connected to an iron plate buried in the ground, and, on the other hand, is connected to the iron core. The lower plate is connected to the line. In case of an earth connection of the overhead line occurring through lightning striking two of the wires, and being led to earth by striking across the two plates, the current circulating in the coil will cause the iron core to jump up, and the arc formed between the two plates to be broken.

The Union Electric Company, of Seattle, Wash., has added a 2,000 incandescent light machine to its plant.

NEW YORK ELECTRICAL SOCIETY.

An Interesting Meeting Relating to the World's Fair Contributed to by Men of Ability and Observation.

ADDRESSES BY C. O. MAILLOUX, NIKOLA TESLA, F. B. CROCKER, C. E. EMERY, J. J. CARTY, JAMES HAMBLETT AND OTHERS.—ANOTHER EVENING WITH A SIMILAR PROGRAMME.

Mr. C. O. Mailloux presided at the meeting of the New York Electrical Society, held Wednesday evening of last week. There was a good attendance. The presiding officer first described the storage batteries at the World's Fair as follows:

Only one interesting feature of the World's Fair wherein the storage battery played a part was in the electric launches. But in this case we have to deal with an application of the storage battery which does not involve any extraordinary features of electrical engineering and not much more than a very careful study of details. You have not to deal there with those conditions which make the storage battery difficult to obtain results with. You have not to deal with conditions where a battery is called upon to give very heavy drafts of current or to receive them. There is plenty of time for charging and plenty of time for discharging. We have to deal with a very interesting application of storage batteries however, and one which, I think, is destined to a far greater extension than we have been expecting, and we hope that at a future World's Fair we shall be able to see applications of the storage battery to navigation on a larger and more instructive scale. The exhibits of storage batteries, that is those exhibits indicating variations and evolutions of type of manufacture, were rather meagre. They were very few. There were three foreign exhibits of storage batteries, but, with the exception of one, they were almost altogether but samples, so to speak. There was an interesting exhibit of storage batteries in the Mechanic Arts Building in the Russian section. It was interesting, not so much on account of the results which that particular type of battery admitted of producing, as on account of the peculiarity of construction. The type itself was peculiarly made with special reference to portability. It was designed by a Russian army officer, I believe, and probably with reference to its use in military operations. There was in the French section an interesting sample, for it could scarcely be called anything else, of a battery made on the Plante principle. Among American exhibits there were some three or four storage batteries, and those you are already quite familiar with and it would be perhaps unnecessary to dwell upon their peculiarities at length.

The other noted exhibits was that made by Mr. Polak, of Frankfort, which was interesting not only on account of the construction of the storage batteries themselves, but was also interesting from the fact that it was exhibited in connection with a very ingenious and interesting device for commutating alternating currents for the purpose of charging storage batteries. It was, perhaps, the first instance where a storage battery was shown on exhibition which was receiving its current from an alternating current as the source of charge. The device is not as complicated as one would be led to expect, considering the service to be performed. It performs its work it quite a satisfactory manner. I had occasion to examine it several times in operation and to discuss its details with the inventor, and I was quite surprised at the ease and the facility with which it lent itself to charging storage batteries. The device consists merely of a system of rectifying the impulses. Let us suppose that the maximum point reached by the impulse is 110 volts, and it requires 100 volts to balance the electromotive force of the storage battery. This device is so arranged that just at the time when the impulses are 101 volts the circuit is connected with the storage battery so that the effect is that the rectifying and commutating device only takes off a chip, so to speak, for each alternation. It takes off the crest of each alternation. That is, I think, the most interesting exhibit relative to storage batteries that was shown there, because it suggests a new line of progress, and now that alternating currents are coming so much to the front and are becoming so popular, and have such great merits as means for the distribution of energy, it is of the utmost importance that we should find means whereby we could render alternating currents capable of fulfilling their mission in a more satisfactory manner, and for that we must have means of storage. There still remains something to be done, of course, with this apparatus. There still remains the necessity of making it do the contrary thing. It does

not as yet enable us to make an alternating current from a storage battery or from a continuous source of current, which, it seems to me, it should be able to do in order to be capable of giving the most benefits that could be realized from such an apparatus. There was one interesting application of the storage battery made, and that was in connection with the floats which were exhibited on Chicago Day, at the World's Fair in the pageant procession. But we have to deal here again with an application which is interesting as a spectacular performance, but not of so much value from the industrial standpoint. My study of the storage battery while I was at the Fair was made mostly from the practical standpoint; that is to say from the standpoint of determining what progress had been made, what devices were there that would be useful to the practical engineer. I regret that there were not more striking examples, more numerous examples and more representative examples of the best progress and the best stage of the art of storage batteries there. It is in Europe that the most progress has been made during the last two or three years in storage batteries, and, as I have pointed out elsewhere, while we have been content to make storage batteries of 200 or 300 ampere hours capacity—may be 400 as the maximum—in Europe it is current practice to use storage batteries of 3,000 and 4,000, even as high as 5,000 ampere hours, weighing as much as 2,000 or 3,000 pounds, each cell. Naturally one who has been following closely European practice and hoping that we might arrive at such a millennium in this country was somewhat disappointed with the results here.

There was an electric carriage, a self-propeling vehicle, looking very much like an ordinary light road wagon or carriage, which carried batteries under the seats and which was guided by the conductor very much as an ordinary motor car would be. This is another one of those matters which is not as interesting from the standpoint of results actually obtained as by reason of its suggesting what we may expect to arrive at later, because I believe that with further perfection in the storage battery, in lightening its weight, cheapening its cost of production and reducing its cost of maintenance, we shall see in the not very distant future some very interesting application of the storage battery of that character and it may be that the exhibition of storage batteries at the World's Fair will have answered its purpose by calling attention to what can be done, and the possibilities to be obtained in that way, and may serve as a pointer to the goal that is to be reached by more extended application and study.

Dr Charles E. Emery: I cannot do more perhaps than to show my slides and explain them as they go along. I have been asked to speak about steam engines at the Exposition used particularly for electric lighting purposes. There is nothing specially new. There were features which were new. There was progress shown in what was done. That progress, as a general rule, was more in the direction of perfection in detail, increase of size and adaptibility to special purposes. The Corliss type was shown in very many forms.

We have here a large Edison engine; 2,800 kilowatt generator, driven by an engine of proportionate size. It was quite a prominent feature in the Fair and attracted considerable attention. There were some attempts made to improve the Edison gear, which did not operate as well as it should, so we did not have an opportunity to test it.

We have here an engine with dynamos directly connected, one of the type which was used for the lighting of the Exposition—the Westinghouse-Church-Kerr engine and Westinghouse alternators of 10,000 lights each. We have a photograph of one here, and a little description will be in order. You will notice the dynamo away from us, as far as the picture is concerned, with a man standing near the fly-wheel of the engine. At this end is the wheel, in which is the governor running in oil all the time. That is a compound engine, with a large cylinder at the top and the small one really hidden inside of the frame so that you do not see it at all. The whole connections are encased as in the Westinghouse type of engine, and the oil is as much attended to by its being carried around with the crank, and they lubricate apparently as well as the smaller types of engine. There are some little distinctive features about the valve gear. There is under the platform a cylinder worked by hand lever by which the valve may be moved up and down, and afterward a hook is thrown in and the engine runs on. There were some eight or ten sets of these, and there were quite a number of the alternators besides worked by the other engines by belt.

We have here the Schichau engine coupled with a dynamo made by Siemens & Halske. It was one of the features of the exposition in its fine finish and the beautiful way in which it operated. There was no noise whatever about it, and the bright gleaming rods turning rapidly in the light made a very pleasant picture. It is interesting to state in this connection that the question of governing this engine has been solved by this firm.

We have here an inside view of the intramural station. We have a small tandem compound engine at this end running the dynamo which was used for lighting the battleship "Illinois." Then we have the large 2,000 horse-power Allis compound engine driving the 1,500 kilowatt dynamo, the largest probably that has ever been constructed. Beyond that there is the Williams engine in the distance, and beyond that there is another Allis tandem compound driving another dynamo. We have here a view of the crank end of the 2,000 horse-power engine driving that immense 1,500 horse-power dynamo. The size of it can hardly be appreciated. So far as the dynamo is concerned, it operates very well. I think the foundations were not very good, so I think the engine has not been worked up to full power, except once when it was short circuited. (Laughter.) There is a pressure pump run by the dynamo that happened to be in the list, and I thought I would stop long enough to show it to you. That supplied water which drove a Pelton wheel and the Pelton wheel operated the dynamo. That is an electric crane. I was very much gratified the other day to note that the general manager of the International Company, I think it is called, was very anxious to have electric cranes on his docks. A large number are used in Brooklyn, and he was very much pleased with the way they operated.

The Chairman: I now have the pleasure of introducing to you one whom the Electrical Society is honored in having had as one of its presidents—Prof. Francis B. Crocker. The best commentary perhaps that I can make on the services which Professor Crocker has rendered American electricians in connection with the Congress, is to express the regret, in which many of you will join, that he was not allowed more his way in connection with the management of the Congress. I am sorry we cannot give Professor Crocker more than about 10 minutes to discuss the subject, because we know it is a very interesting one and one which he will present in a very interesting way.

Prof. Crocker: The Electrical Congress was a very important part of the electrical exhibit at the World's Fair, in my opinion, and was remarkable in a number of respects. Mr. Mailloux has already placed me in the position of making an apology, because he has indicated that it did not pass as well as it might have done. Now, the fact is that electrical congresses only occur very rarely; there have only been four or five before this one, and only two that were really official congresses, and their work was not entirely satisfactory, and the work of this congress was to revise and to fix the work of the previous congresses, and in that respect I claim that it was a great success. The Electrical Congress of Chicago, of 1893, was first conceived by the officers of the American Institute of Electrical Engineers when New York was expected to be the location of the World's Fair. It happened, in the course of events, that New York was not that location. The consequence was that it was transferred to a place where they had no regularly organized body to take charge of it. The National Society of Electricians happened to have its headquarters in New York. The consequence was that certain purely business matters of management were not carried out as perfectly as they might have been; but I think the technical and scientific and social results of the Congress were fully as great as if it had been held under more favorable circumstances and with perfect business management. That, I think, is about all that Mr. Mailloux meant when he hinted at the absence of perfection in the congress. I claim that in three respects the congress of 1893 held at Chicago was unique, that it never will be excelled, and it never has been excelled. In the first place, the Electrical Congress last Summer gave final names and values to the electrical units. We have had a number of ohms in the past; we have had an equal number of volts, unfortunate as it may be, and we have had other units accepted more or less completely and giving more or less satisfaction. But it remained for this congress finally to determine and finally to give names to the various units, and in that respect the congress never can be repeated or equaled in any respect. The ohm, the volt, the ampere, the farad, the coulomb, the watt, the joule, and all the units received their formal and final definitions. It is a fact that those definitions had been used before; it is also a fact that those values had been used before. But they had never been internationally accepted. There were some 25 delegates officially appointed by various governments, some eight or ten in number, to represent them officially. Consequently the action of the congress was formally and internationally binding and of great importance. Such a gathering as that had never come together before, and the time was just ripe for the final definitions of the various units, which I hope are final. I should hate to live to see another value given to the ohm. I hope I never shall. I have lived through two or three ohms and I do not feel able to cope with any more. Our instruments in the college are calibrated in terms of three different units already, and when you have resistance boxes which should be absolute and standards of the utmost reliability and accuracy, when you have three different values for the three different ohms, that is bad enough, and, as I say, I do not feel strong enough to stand a fourth, and I hope it will never be required of me. Therefore, this Congress has put a stop to this duplication and reduplication of the ohm. In that respect I think this Congress is very important. In another respect it is also important, and that is that the henry was defined to be the name of the unit of self-induction, and in that fact we have an acknowledgment of the great services rendered to science by Prof. Joseph Henry, an American, and in that fact also we have a recognition of the importance of America in electrical science. If there was no American name in the electrical units I think it would be a reproach, not only to American electricians, but to America as a nation, and I feel a great deal of satisfaction that I have advocated that name, in fact proposed it, and that it was finally adopted at this congress, and as an American I feel that in that comparatively small matter the congress did a work that was not entirely unimportant. They were really obliged to do that, and I foresaw that fact, because nobody could come here as a guest of the American people and vote against giving the name of Henry to that unit. (Applause.) It was proposed by a Frenchman and seconded by an Englishman.

The third respect in which this congress was important and equal to any that has ever been held, and fully up to any that will be held in the future, was the important papers and discussions that were brought forward at that congress and the eminence of the men who read those papers. We succeeded in getting at this congress most of the important electricians of Europe as well as of this country, and I think that is an extraordinary result, and the papers, which those men brought to us, were papers of the greatest importance, and will always mark an important step in the progress of of electrical science. In these three respects I claim that the Electrical Congress of Chicago of 1893 was thoroughly satisfactory. The mere fact that there was no place to put your hat and coat, or something of that sort, is not a matter of sufficient importance to in any way interfere with the success of the congress. (Laughter.) As to future congresses I should say that there was little left to be done. Professor Rowland, one of the most eminent of American electricians, told me that he thought that there would never be occasion to hold another congress. I do not quite agree with him in that respect. I suggest that there are three things which will probably have to be taken up by future congresses. These are: Magnetic units and names for them, a standard of light, and an international nomenclature for electrical terms and quantities. I think that covers the subject as well as I can cover it in the limited time. (Applause.)

The Chairman: The henry was first suggested by Professor Crocker. (Applause.)

We pass on to a name which is magic in this country and over the world, the name of a man who is one of the greatest explorers and discoverers of the present century, Mr. Nikola Tesla. (Applause.) A man who, perhaps, has gone farther toward the border line of discovery in analytical and technical physics, the vibrations of matter and the minute analysis of those processes that neither the microscope nor the crucible can reach and which only the mind of the trained and careful student, possessing qualities as are scarcely allotted to more than one man in a century, like Mr. Tesla, can deal with. I shall have to give Mr. Tesla, I suppose, at least, 15 minutes. (Applause.)

Mr. Tesla: I have with great reluctance accepted these compliments, because I had no right to interrupt the flow of speech of our chairman. You may, perhaps, know—at least, those of you who have followed the electrical development more closely—that the subject about which I am to say something is one which I recently presented before the Electrical Congress. During the past two years, or so, I have been gathering results and preparing work which I had in mind to present before the annual meeting of the American Institute as one of its members. But, as the date grew near, I found that the problems became so complicated and difficult that I could not do justice to the subject in this limited time, and so I made up my mind to drop the work for a little while, and go to the Exhibition and learn what I could, as any reasonable man would do. But the pressure at that time exerted upon me was so great that I could not resist when a number of scientific men urged me on to do something—deliver a lecture. A great many promised that they would come, but at the last moment they became ill, and when the programme was sifted down I was the only healthy man left who had the time to deliver a lecture; and so I managed to take some of my apparatus, and through the courtesy of some officials of the American Express Company, especially Mr. Sherman, to whom I am indebted, I was able to arrive in time, pretty nearly losing my opportunity by the impoliteness of one of the officials of the Fair; and so I gave a brief outline of this work.

Now, as a matter of fact, at that time I had gone considerably into the study of the practical aspects of the work which I was to present, and my notion was that I was touching upon something very important, something which would lead perhaps—so I thought in my enthusiasm—something which would lay the foundations of a novel industry, perhaps of more than one industry. But to speak in that strain before such a gathering as I had the honor to address there would have required a nerve which I did not possess, or, if I did possess it, it would be sure to leave me when I wanted to use it; and so I dwelt chiefly on those features which possessed a purely scientific interest, my desire being to present the subject very modestly, as I was not quite sure of some of the questions involved. Right after the lecture I asked one of my friends what he thought of it. He said it was well enough, but it could have been better. A prominent engineer came to me and said: "Mr. Tesla, I want to tell you something, but I fear it may offend you." I knew what was coming and so I asked what it was. He said: "Well, don't you work on steam engines? You have done some work in electricity. If you stick to it you will do some good work, but if you work on steam engines you are bound to fail." (Laughter.) All these men that I mention are the most prominent men in the profession. Another said: "I wonder what Tesla is going to do with his blessed engine." Another, to whom I showed the advantage of doing away with complicated mechanism and generating electricity directly, said, after he had watched it for a long time, "Couldn't you apply this to rotating motion?" Now, this is the way that my work was received. (Laughter.) But I was quite prepared for that, because for fully two years I had had these ideas in my mind. I rejected them and rejected them again and again, until I got in my mind the construction of the apparatus, until I overcame some difficulties which at first seemed to me insuperable, and, finally, I resolved myself to this work. One of the first impulses which guided me was to produce an absolutely constant motion, which would be independent of any friction losses, or gravity or temperature changes within very minute limits. Now, you can use a pendulum, you can employ a clock-work or a vibrating spring, or some such device as that, but they are very unreliable. I wanted to produce a positive motion, so that I might operate what I called some time ago a disruptive discharge coil. I may assume that some of you know that some time ago I advanced a method of producing currents of high frequency from direct or alternating currents. With a device which I invented I was able to maintain a vibration with perfect constancy. This device consisted of a spring which required several tons of force to spring a certain distance, and which was constantly kept in vibration by steam pressure or air pressure. In the beginning I used springs of tempered steel. These steel springs would break, though they had a section of two or three square inches. So I resorted to hair springs. The hair springs would not break, but they had no constant resistance. Then I made the chambers of the hair springs communicate with the outer air. This device yields a constant vibration, and as the force which is driving it is many tons, and the friction but a very small matter, it is unaffected by the pressure, and so I have a constant vibration. This was one of the chief features I wanted to present, and is the device which I believe will be used for many purposes, for instance, governing all sorts of mechanisms, engines, and so on. This was one of the features which contains much of interest for scientific men, because with this I am now enabled to produce currents of perfectly constant frequency. But this was merely the portion of the work which I have been doing. You have seen a few designs of engines described by the eminent speaker, who is one of the most competent to speak on the subject, and who has shown us a great many complicated mechanisms. They are exactly adapted to illustrating what I have to say, and I would ask whether it is not worth while I attempt to simplify those mechanisms which we have been using heretofore for the production of electric currents. When we look at a steam engine and inquire where the power comes from that drives the steam engine, we will always find that the power comes from a little box—a cylinder with a piston in it, and all the other appurtenances are really but to keep it going. You may do away with the fly-wheel, with the cross-heads, with the eccentrics, with all the appliances, provided that you can in some other simple way govern the motion of the mechanism. So then my first idea was to apply the motion of the piston, which is freely movable, to a magnetic field, to move a magnet or a coil in a mag-

netic field and so generate currents by this direct motion. Now let us see what we can do in that respect. First, we reduce the weight of the engine for the same pressure and the same piston speed to $\frac{1}{10}$ or $\frac{1}{15}$ if not $\frac{1}{20}$ of its weight. Furthermore we do away with all mechanical frictions. The engine designed according to my ideas has a mechanical efficiency of 99¾ per cent. Now that is in itself a very big item and renders it worth while endeavoring to make this mechanism a commercial success. But there are other far greater things. You will find that engineers often say what an advantage it was to apply the direct motion of the steam piston to a pump. In reality the advantage in a pump is but a very minute one. The water column has got an enormous inertia and what we do gain in the direct acting pump is merely a matter of overcoming some additional frictions which we have in the ordinary engine. We may take the mechanical efficiency—I gather the data from various works—we may take the efficiency as, say, 81 to 82 per cent. at the full load. But the efficiency is much less on a varying load. Then, furthermore, we have got these variously estimated. I take the figures, which I have found to be fair, giving this as the efficiency. Now the dynamo again has got mechanical losses due to friction, and furthermore the wire is never utilized fully in the dynamo. In my construction the dynamo may consist of a simple coil of the magnet and a simpler coil, which is all immersed in the magnetic field. There is no useless wire, consequently dynamo and engine, if they are reduced considerably in weight, increase in efficiency. There is only one engine which can equal it in output, and that is the turbine. With the steam turbine we can obtain an enormous output, and that is the reason why the steam turbine, in my opinion, may be found a valuable adaptation for driving dynamos; and then convert the motion by means of alternating dynamos, and I think the steam turbine has in itself a physical cause why it cannot surpass a certain efficiency, and that is because we drive turbines by impact. A turbine might be very efficient if the medium which propels it were incompressible and homogeneous. But it cannot be efficient if we drive it by means of isolated shocks. Furthermore, we cannot in a turbine gain all the expansion. These causes, I think, will limit the efficiency obtained in turbines. But in reciprocating mechanisms we can, provided we can obtain a sufficiently high speed of the piston, expand the steam at an enormous rate. It is perfectly practicable in these mechanisms which I have been working up, to obtain, if you want, a speed of 100 metres a second, and while I do not contemplate producing such speeds, yet it is quite possible to do it. But since we can produce higher speeds, we might as well increase the speed two or three times and so augment the activity of the mechanism and raise the efficiency. Furthermore, as I am enabled now to work without a packing, the expansion occurs at an enormous rate, and the engine being of such character that the exhaust can be readily reduced to pretty nearly the atmospheric pressure, the mechanical friction is reduced to such a small figure that we can raise the temperature of the steam very considerably. In high pressure steam engines one of the greatest troubles is the lubrication. We can go so far with the mineral oil, we can go so far with ordinary oil, but then we reach a point at which we cannot go any farther; the lubricant will not work, and I am informed by very able practical engineers that about 250 pounds per square inch of steam pressure is as high as we may practically go. With this engine we may go much higher. I am now preparing a boiler which will give me up to 350 pounds pressure. It is very important, of course, to get the pressure very high. In these mechanisms we are confronted with two things. For what are they going to be used—for light or for power? If we want to drive motors we must have a long stroke and a slow frequency; if we want to drive lamps then we want a very short stroke and a very rapid motion. To have a high speed with short stroke we must have a great initial pressure, because you know the number of vibrations increase only as the square root of the pressure. So if we want to have twice the number of vibrations we must have four times the pressure. But, on the other hand, four times the pressure and twice the number of vibrations means eight times the output; so it is, therefore, very important in this mechanism in which the power depends on the square to obtain as high a pressure as possible. It is on this line now that I am working. It is more economical to produce rapid vibrations than low vibrations. But, so far as the economy of the dynamo is concerned and so far as the economy of the engine in general is concerned, it is better to produce a long stroke, because a long stroke means a high velocity. I have an apparatus which runs lights in the laboratory, and shortly, I think, I will have something which will be ready for practical application. I think I am not mistaken in believing that we are going, very shortly, to have a means at hand of producing twice as much electricity from coal as we can produce at the present time. This is subject, of course, to a test, but I am quite confident that it can be done. (Applause.)

Mr. J. J. Carty: To give a proper idea of the telephone as exhibited at the World's Fair would mean a review of the present state of the art of telephony, and I know that you do not want me to undertake anything of that sort. I, therefore, will give you a statement of some of the things which impressed me most at the World's Fair. The first thing that struck me was that it was particularly an American exhibit. The things shown by foreign manufacturers were of little interest or novelty, and some of the things which were found in the foreign sections were copies of what had been developed in this country. The general feature of the telephonic work at the World's Fair was interesting more from the tendencies which it exhibited than from any details of structure. It seems that the later work of telephony has been confined more to doing those things which we know how to do and doing them well than in trying to find out things which we do not know; and how well we have succeeded in doing those things which we know was well exemplified by the working of the long distance line. One of the most interesting exhibits of telephony at the World's Fair was made by the telephone to New York. It was not necessary to have them there. But all New Yorkers having telephones went to the magnificent temple which was provided by the telephone company at the World's Fair and talked to their homes and offices in all parts of the city without any difficulty whatever. I think that was the most striking exhibition of all, when we remember that it is but 17 years ago that the first crude apparatus was exhibited at the previous World's Fair, at Philadelphia. Passing on to some of the tendencies in the way of construction, the movement away from series work, which was begun at the Detroit telephone convention, towards multiple arc work, was very firmly developed. Not only are our telephone stations connected in with multiple arc, but the central office system is also on the multiple arc basis. Spring jacks were formerly connected into the line and introduced a number of contacts. These have all been dispensed with, the contacts avoided and the connections made in multiple arc. Those of you who have been cut off in the middle of conversation will know what a poor contact is. That is all avoided in the new work. The exhibition of American underground cables was particularly complete. In that respect this country may be said to excel. The material generally used is paper loosely put upon the wires so that the dielectric is really a mixture of paper and air. This gives a very low capacity and is very suitable for telephonic purposes, and the wire from New York to Chicago includes a great many miles of such cable. The absence of any particular novelties in the way of a telephone would prevent me from going further into details, and, as the members of this society have already visited the telephone office and are quite familiar with the state of the art, when I say that the improvement has been on general lines, which have already been indicated, that is doing well those things which we know, I think that I have said about all that is of interest. (Applause.)

Mr. James Hamblet: About 10 days ago we completed the first decade of standard time in this country, and that fact alone enabled us at the Columbian Exposition to make use of the most admirable system of time that was exhibited there. There were over 200 clocks exhibited at the exposition. Electric clocks were exhibited first in the exposition of 1851, and it was said then by Sir Edmund Becket that Mr. Shepherd proposed to run all the time of the exposition then by his electric clock. "But," said he, "he failed to do so, somehow or other, because sometimes the electricity would not work," and that, I believe, has been the odium that electric clocks have had to bear from that time to this. Mr. Dennison went further to say that they totally failed there, and the time was kept by one of Dent's clocks, which Mr. Dennison designed. The kind of clock which Mr. Shepherd made then, were those propelled entirely by electricity, the current propelling the hands. Within a few years an invention has been brought out by which the clock is not entirely propelled by electricity, but is simply wound by electricity at stated intervals, that is, it is wound each hour by electricity. Those patents are owned and used by the Self-Winding Clock Company, of this city. The Self Winding Clock Company has made arrangements with the Western Union Telegraph Company to issue those clocks to all the cities of the United States. They have something like 20,000 of those clocks in operation. They made a very elaborate exposition at the World's Fair. All the principal buildings, some dozen of them, had more or less clocks. The terminal railway station had 24, and quite a number of those clocks showed the time of the different countries. There were about 70 clocks in the Exposition buildings and in all the State buildings. Each State building had one or more clocks, and then the company itself in its exhibit in the Manufactures and Liberal Arts Building had something like 90 or 100 clocks on exhibiton, from a tower clock down to a mantel clock. They were all wound by electricity once an hour from one of these clocks. They were all corrected each hour by a very fine standard clock and I have the pleasure to announce to you that the inventor of the clock is present in the audience, and it is most certainly a most admirable piece of work. He began with the Dennison escapement and has elaborated and perfected that escapement and it has to-day, under his hands, attained better results, I think, than all the ordinary gravity escapements. That standard clock was corrected daily by the signal from Washington, and it kept all the clocks in the Exposition of that character, over 200, in time, and they gave universal satisfaction. One of the newest features in the whole exhibit was the tower clock in the center of the great Manufactures and Liberal Arts Building. That clock was one of the first instances of a tower clock propelled entirely by electricity. That machine enabled us to put in a church, or in a church tower, a clock without the cumberous weights and the huge mechanism and the firm fixing required for a heavy pendulum. There was one other set of half a dozen clocks exhibited in the Electricity Building. I did not examine them particularly, but some of them were not going at the time I looked at them. I do not think they produced the results that the self-winders did. There was in the German exhibit a very intricate and delicately made apparatus for transmitting time for an electric clock system, but that was not in operation. That was about all I noticed of electric clocks in the Exposition. There were chiming clocks in the clock exhibit—chiming clocks that played tunes, chimes, the quarters, etc. There were signal transmitting clocks. That has become quite a feature under the hands of the superintendent of the clock company. There were programme clocks also for use in schools and colleges. There is in this college a very elaborate system of that kind, but I believe it is not made by our friend. The self-winding clock is propelled by a small revolving motor of the ordinary type, of quite a primitive type I may say—simple armatures on a little drum revolved by magnets. The company is now prepared to make an improvement on that motor. That motor requires very delicate adjustment and to be carefully made. The improvements consist in making it a vibratory motor and which removes all the difficulties of the motor first adopted.

The Chairman: The hour is advancing and we have scarcely finished more than half of our intellectual feast. We have disposed of nearly all the topics excepting those which relate to light and power. I, therefore, think, instead of endeavoring to get through with the programme this evening, which would occasion a considerable shortening of the time to be allowed to the remaining speakers, that it would be better to make another night of it, which could be wholly devoted to light and power. A motion to that effect would be in order.

Mr. Wetzler: I make that motion, Mr. Chairman. (Carried.)

Mr. Hamblet, at the request of the chairman, exhibited a collection of views showing the principal features of the World's Fair.

Dr. Emery: I omitted to mention that there was a steam turbine exhibited in the Danish section which was quite interesting, running up into 20,000 and 30,000 revolutions a minute, and that very high speed and 20 horse-power were obtained with a wheel about four inches in diameter. It was made exactly like an ordinary turbine, excepting that the steam went only one way through it. At the periphery were a series of plates set to a curve, and the steam, in a series of spouts, shot directly on those little blades. The wheel itself was not more than half an inch thick, and yet the power of the steam was exerted at that high speed so as to obtain, as I say, 20 horse-power with a very good efficiency. It was about 80 per cent. The difficulties of making machines running at that high speed were overcome first, by very excellent workmanship, and secondly, by the simple device of making the spindle to which the turbine was attached so light that it would spring, and thereby move the center of gravity sufficiently so that the wheel would run on the center of the gravity, instead of on its actual mathematical center. It was perfectly balanced in the first place, and every pains taken to make a running balance. But to avoid that last little difficulty, which would have shaken the machine very badly, the spindle was, as I say, so light that it would throw itself out of center just sufficiently to run on the center of gravity; that through a spiral gear, geared down to much slower speed, ran a pair of double dynamos. In fact, it was balanced so that the power went two ways from this shaft; and while they were not working it to more than five horse-power, they have tests of prominent engineers abroad to show that that little machine, which one could almost carry in the pocket, did really develop 20 horse-power.

Mr. Tesla: I would like to ask Dr. Emery whether this efficiency figured referred to the mechanical efficiency of the turbine, that is 20 per cent. loss in the mechanical friction.

Dr. Emery: That is my recollection. It was about what we usually get in that class of apparatus.

Mr. Tesla: I see a slight reproach. Perhaps I imagine it. I might have been misunderstood before. I did not mean to say that the turbine is mechanically inefficient. The steam turbine may have 80 per cent. of mechanical efficiency. But what I meant was the thermic efficiency. I do not think the thermic efficiency can be reached in apparatus like that. To offset this, I would say there is nothing to prevent the production of a reciprocating engine on the plan I mentioned before, which would give the same weight and the same power. The power which a piston gives up during a stroke is proportioned to the square of the amplitude. Now, with a very long stroke and a freely movable piston, we can reach any velocity, practically, that we want to. We can transform the energy of the piston by shooting a magnet through the field into electric energy, and there is nothing in the way which would prevent, for instance, with some such mechanism as I described, obtaining with that weight practically the same power as with the steam turbine. In fact, I think that the specific output of this mechanism is wonderful. Out of a little thing no more than three inches in diameter and four or five inches long, it is quite easy to obtain one horse-power with small stroke and fair pressure, so that the specific output of the apparatus, while it may tell on the efficiency in this way that it diminishes the losses of condensation, is, of course, not a very remarkable thing in the steam turbine, because in the steam turbine we have, besides, a very great loss in the clearance and, as I said, in the impact; whereas in the reciprocating mechanism we have not. Now I have shown some of my apparatus at the Fair, which was quite able, with a velocity of three and one-half inches a second, to develop half a horse power with a pressure of 200 pounds—a very little thing, no bigger than that glass. I mention this in reference to the statement of Professor Emery, as it might have been applied that my remark in respect to the turbine was something in contradiction to his statement.

Dr. Emery: I will only say that in what I said I had no intention whatever of traversing any statement made by Mr. Tesla. It was an interesting feature which I omitted the first time because I had no cut of it. If I were asked whether I should advise putting these turbines, running 30,000 revolutions a minute, in a large establishment, I might have a different statement to make. But it is certainly very interesting.

Mr. Wetzler: Before we adjourn I would like to remark that I have been a member of this society for nearly 10 years and I count this meeting as one of the most profitable, as well as one of the most interesting, that I have ever been able to attend. I, therefore, move a vote of thanks to the gentlemen who have favored us with their remarks this evening.

Mr. Mailloux: As I am an interseted party, I will ask the gentleman to put the motion.

The motion was put by Mr. Wetzler and carried, and the meeting then adjourned.

Buffalo Electrical Society.

"Electricity at the World's Fair" was the subject of a very interesting lecture delivered before the Buffalo Electrical Society at its last meeting, held November 16. The society's president, Mr. Phillip K. Stern, was the lecturer. He gave a general outline of the electrical exhibits at the Fair, touching on those of scientific importance, and others equally important on electrical engineering. The attendance was large, and there promises to be a revival among local electricians this Winter. President Stern, Frank Kitton and Frank C. Perkins were appointed a committee to secure a paper, if possible, for the next meeting from Prof. George Forbes, the electrical engineer of the Cataract Construction Company. The secretary has written to Mr. Nikola Tesla with a view to making arrangements for a lecture in the near future.

A New Trolley Line in Italy.

The first electric street railway in Milan, Italy, was recently inaugurated in the presence of the Italian Minister of Public Works. The line, which is on the Thomson-Houston overhead conductor system, is owned by the Societa Generale Italiana di Electricita Susterna Edison, and runs from the de Place Duomo to the Cours Semproni, a distance of nearly two miles. The plant at the power station comprises two Thomson-Houston dynamos, giving 100 kilowatts at 500 volts, one being driven by an Armington-Sims engine.

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The first of the new year is looked forward to as the natal day of a new era of prosperity in the electrical business.

Electrical men suffered with the rest of the world in the defeat of Yale by Princeton at the Thanksgiving Day foot-ball game. Hindsight is better than foresight.

General Electric rumors are as plentiful as ever. The stock has been falling off in price lately and people are asking why. The only man who knows and will tell must have taken to the woods, because he can't be found.

State Engineer Martin Schenck thinks that the use of electric power on the Erie canal boats will be of no great value. At any rate, the recent experimental demonstration was an entire success and time will prove its value.

Mr. Henry L. Storke, of Auburn, N. Y., who has just been appointed postmaster of that city, is the latest well-known electrical man to receive political preferment. Mr. Storke is a genial, whole-souled gentleman, a man of great executive ability and experience and a proper man for the place. We congratulate him and the people of Auburn.

The ELECTRICAL REVIEW has several times predicted that the solution of the rapid transit question in New York city would be found to be an underground electric railway. It now looks as if the specially appointed rapid transit commission of this city had begun to see matters in this light. Gentlemen, electricity is the power for you, and we do not doubt but that capital will be forthcoming to put the underground road through.

Pennock, the primary battery artist, announces, from his lair in Boston, that he has "a 50 light plant running. Exhibition hours from 11 to 4. Forty-nine of these lights are produced for absolutely nothing from the 'mysterious generator' you mention." What happens during the non-exhibition hours and the cost of 50 lights might prove interesting. Still we must congratulate this fellow on his audacity. He is certainly a great discoverer if he has discovered anybody who will believe such idiocy as he sends out.

WHAT IS AN ELECTRICIAN?

Two questions closely allied and apparently equally without the pale of the *Century* dictionary are "What is Electricity?" and "Who are Electricians?" The answer to the former may be found in the theories of Hertz, Tesla, and other scientists, but who shall dare to encircle the latter with a reasonable, definitive paling? There was a time when to be an electrician was a high honor, and placed its worthy exponent in the front ranks of science. He could well afford to pride himself upon the appellation, the title, the rank it bestowed, and the associations it entitled him to.

But the times have changed somewhat. Present conditions exemplify to an extent the old saying: "Familiarity breeds contempt." There is no longer need of a college education, a laboratory practice, or a mathematical course. The legal value of an ohm may worry a Carhart or a Lord Kelvin, or the chamber of delegates may wrestle over nomenclature—the new-fangled electrician heeds not, cares not. He knows a shorter road to fame. A little climbing of poles for the Western Union, or a few weeks digging their post holes, a month or two attending a dynamo with the running accompaniment of lots of oil, and as a side amusement, the substitution of broken lamp butts for fuse plugs, or the placing of incandescents on arc circuits—and he is an electrician—at least, that is what *he* says.

From the electrician to that higher grade of electrical engineer, is but a step with the modern aspirant, and the preferment is brought to him quite often through the long, narrow route of the speaking tube. The door bells of his dupes ring—for a week—his praises, the blazing snap from his spark coil glows with fervent applause; he invents an application of electricity which embodies all the elements of danger to life or property pertaining to the subtle agent, and he slides out of the previous oblivion of a back shop, rubber stamp in hand to print his own cards, as an electrical engineer.

Is this a fanciful picture, or is it overdrawn? In a city not a thousand miles from Cincinnati, there was once published a "write up" of one of these electricians. That he could plead ignorance of the matter is not possible; he paid for it, or it would not have gone into the publication. It covers such a perfectly clear definition, is so complete and comprehensive as to entitle it to a place in a revised edition of Crabb's "Synonymes," or Roget's "Thesaurus." It is a pity the *Century* dictionary was too early for it. Read and absorb it. The name of the scientist is not given, from motives of the extremest modesty.

"MR. BELL TINKER.—The progress made during recent years in the applied branches of electrical science is truly marvelous. Electricity, as a means of lessening the work of men in all lines, has come to stay, and in this city in particular the number of responsible and reliable houses devoted to it is remarkable. Prominent among them is that which forms the subject of this sketch, and which fills a sphere of usefulness peculiarly its own.

"Mr. Tinker is a native of this city, and is a thorough practical electrician, who for several years has followed this business with great success. His establishment is neatly appointed and well ordered throughout, and is in every respect well adapted for the ends to which it is devoted. The various departments are fully equipped with the latest improved tools, apparatus and appliances known to the trade. Skilled and experienced hands are employed, and all the materials and supplies furnished by the firm are unrivaled for reliability, efficiency and uniform excellence, while the prices quoted in all cases are extremely moderate. Mr. Tinker carries on a general business as locksmith and bellhanger, and makes leading specialties of putting in and repairing electric bells, electric alarm clocks, gas lighting, burglar and fire alarms, inserting speaking tubes, repairing wringers, carpet sweepers and lawn mowers, grinding and repairing of scissors and knives, repairing and covering umbrellas and parasols, repairing bicycles and all kinds of jobbing. All orders entrusted to him are promptly executed in the most excellent manner, etc."

Now, while Mr. Tinker doesn't advertise to furnish dynamos and do wiring for power or light, it would probably be an even bet that he would, if the opportunity offered. There are plenty of his ilk who do. And herein lies much, if not most of the hazard of the terribly dangerous electric current that so exercises our good friends the insurance fraternity.

There are two cases when an electric plant is dangerous. The first is when the ignorant or scheming contractor employs a cheap electrician to place the installation. Uninspected by competent knowledge, that plant is a standing menace for all time. "Just as good" is a miserable excuse for any but the best of work in an electrical installation—the best is none too good.

The second case is that of a first-class installation, which is subsequently handled by "electricians" who do not know the difference between constant current and constant potential, and think because a copper wire of the same size as the fuse wire doesn't blow, it is better in case of what he denominates a "short." Such a scientist is a cheap man, and through the grossest ignorance and carelessness may in a week thoroughly demoralize the most perfect installation.

If the underwriters could in some way educate the owners of isolated plants up to the necessity of employing experts in place of these cheap ignoramuses, either as constructors or as house employés, there would be less to complain of. Until that time it is fair to presume that "electricians" will be counted, not weighed, made by the hundred, bunched like radishes, and peddled from every electrical market wagon.

Comment is now being made on what is termed the unnecessary slowness of the Rapid Transit Commission. It would seem that these fault finders hardly realize the grave importance attached to the adoption of a new plan for rapid transit in this city. There would, undoubtedly, be a change from steam to electric locomotive, and with the excellent example afforded by the Intramural Railway at the World's Fair, as soon as the route and method of construction is fixed upon, the consideration of electrical propulsion should be immediately acted upon. A work of this size is no trivial thing, and it could hardly be expected that it could be disposed of without much deliberation and discussion. Let us hope, however, that soon some result will be reached.

It seems that as soon as fundamental patents on any electrical apparatus or device begin to expire, the press of the country begin to inform their urban and suburban readers of the death of such and such a patent, whose expiration is of grave importance to the electrical fraternity. Here is a sample from a paper whose name is not very much unlike the *Mudtown Mixer:*

The great Edison incandescent wire patent has expired. For the benefit of our readers who do not know what an incandescent wire is, we would say that the new electric light put up at the corner of Huckleberry and Green streets, which sheds its bright rays over the residents of Mudtown, at the rate of two horse-power a minute, is called an incandescent wire. Now that this patent has died, anybody can make these incandescent wires without being troubled by Mr. Edison.

McElvaine was the second man sentenced to die by electricity. He had two trials and his execution was delayed many times, all the legal ruses which were employed to save Kemmler being used in his favor. He was finally executed February 8, 1892. It was the first electrical execution at which reporters were allowed to be present. Nicolo Tesla, who was sentenced to die at the same time, had his sentence commuted to life imprisonment.—*New York World.*

Congratulations, Mr. Tesla, on your narrow escape and how do you enjoy your life imprisonment in the "Gerlach"—one of the fashionable and popular hotels of this city?

It is predicted that within a year all the principal officials of the General Electric Company will be located in New York, and the double-headed system will be abolished. Doing away with unnecessary red tape is always a good thing for a large corporation.

CORRESPONDENCE.

OUR ST. LOUIS LETTER.

Battery Specialties.—A plan is on foot to establish an extensive plant in St. Louis for the manufacture and assembling of the different parts of the various makes of leading open-circuit batteries.

The Schultz Belting Company are actively engaged in the effort to secure additional stock for shipment on orders from their regular customers. A few days ago they shipped a heavy order of belts to England.

E. P. Allis & Company, of Milwaukee, on the recommendation of the Committee on Public Improvements, have been awarded the contract for the new engines at the water works by the City Council of St. Louis.

Mr. F. P. Valentine, treasurer of the Framingham Brass Manufacturing Company, South Framingham, Mass., carried away a pocketful of orders from St. Louis this week, one from the Columbia Lamp Company, calling for 100,000 lamp sockets and caps.

Mr. George A. McKinlock, president and treasurer of the Central Electric Company, Chicago, called on the St. Louis trade last week. Mr. McKinlock is well pleased with the bright prospects for a rapid increase in business, and is confident that the coming Spring will see an unusual demand for electric material.

Morse's Lightning Calculator.—Cushing & Morse, the well-known progressive Kerite agents, with headquarters at 225 Dearborn street, Chicago, have presented to a number of their St. Louis friends several Morse's pocket calculators for quickly determining the size of wire required in given circuits. Embodying simple, practical and convenient principles, this time saving and accurate device should be in the possession of every user of high grade insulated wires.

Mr. R. V. Scudder, the genial secretary and general manager of the Western Electric Supply Company, 911 Olive street, St. Louis, has just returned from a successful southwestern trip, and is very sanguine over the business outlook. Not only were excellent crops obtained, but they were, from necessity, moved without outside assistance, and thus there is every evidence of a profitable trade from that section, as the demand for extension and improvements is quite general.

The Electric Club.—At the annual meeting on last Saturday evening the present officers were re-elected, with a slight change in the board of managers. On December 1, the members will have a banquet, and listen to an address from Mr. James I. Ayer. The noonday gatherings in the Club rooms testify not only to the ability of the *chef* in supplying such a variety of dishes at such comparatively low prices, but also to that spirit of disinterested loyalty that prompts members to travel a distance of 10 or 20 blocks in order that the interest aroused may be maintained and extended, and a permanent, healthy growth of the club assured.

The Columbia Incandescent Lamp Company, 912 Olive street, is constantly adding to its plant, equipment and working force, and probably has the most modern and complete lamp factory in the country, save one. Thus it is gratifying to learn that the consumers of lamps are showing, in a very practical manner, their appreciation of the manly, though costly, policy the Columbia Company has displayed in defending its right to manufacture incandescent lamps, and to establish an open lamp market. At present, orders are calling for lamps at a rate requiring an output of 100,000 a month, and Mr. Rhotehamel hopes soon to be in a position to supply 200,000 monthly. Renewal orders are based on the high efficiency of the lamp, as well as on the protection guaranteed to all users of Columbia lamps.

St. Louis, November 29. F. DeL.

OUR CHICAGO LETTER.

Storage Battery Car.—The Chicago *Tribune* does not hesitate to keep its readers posted on every new electrical invention that is brought out, regardless of actual merits or relative standing. A short time ago it devoted considerable space to a description of the Fullner primary battery that was soon to render "dynamos a thing of the past." It reported that each cell tested was three inches by five inches, giving two volts and 20 amperes, with a capacity of 150 ampere hours; "there was no local action and consequently no waste of material." Zinc filaments three-sixty-fourths of an inch in thickness in constant service for two months, lost but two-thirds of the weight, though 15 lamps were supplied with current during that period. Thursday morning's *Tribune* devoted nearly a column to the Globe storage battery car, crediting J. C. Porter with the statement that it "will run 125 miles *with one charging*, and is commercially practicable." Further statements of interest to the electrical fraternity are that the "majority of batteries which have been so extensively tried for traction have been equipped with common lead cells and could not be made to last more than 60 days under continuous use." The Globe cells, on the contrary, "grow better with usage, the present cells having been in use four months, and show no signs of failure or wear. The weight of the car is less than that of an ordinary trolley car, and the cost of changing over will be less than $300 a car." Mr. Porter did not say whether his grid is of rubber with the active material pasted on, and an intervening packing of slag or mineral wool. However, speed the day when battery cars will be used on all lines!

The World's Fair.—There is every indication that the South Park commissioners and the Exposition directors will, this coming week, settle the question of retaining the Court of Honor, with the special illuminating features. The question of contributing funds for the operation and maintenance of electrical features is now being considered by the Illinois Central, the Alley "L" and City railway companies, who base a profitable return on the excellent financial results that followed the installation of the Yerkes' electric fountain in Lincoln Park. There are 2,300 incandescent lamps on the basin walls and the bridges; 2,050 on the Administration building, and 3,800 along the other cornice lines. A Westinghouse official is quoted with the estimate that the entire cost of maintenance and operation of 10,000 lights could be figured at the rate of six-tenths of a cent an hour. Another official estimated that it would cost $125,000 to replace the plant that at present constitutes the illuminating plant of the Court of Honor. Of this sum the machinery would cost $50,000, the wires, sockets, lamps, $40,000, and the work of installation, $35,000. If some definite plan is formulated, approved and carried into execution, it is to be hoped that the details will be on the same high plane of artistic merit, and that the people will appreciate the outlay by a liberal patronage of the lines of transit contributing thereto. It is also the intention of the South Park commissioners to maintain the arc lamps on the wooded island, in certain portions of the grounds, and on the nine handsome iron bridges spanning the lagoons. The balance of the ornamental arc lamp-posts will probably be sold, and several offers have already been received for same. Under present conditions the Administration building will be vacated December 1, and all lights and heat shut off, the officials moving their offices down-town to the Masonic Temple. The daily paid attendance is dropping down to less than 1,000. Old Vienna is the only building on the Midway that is completely leveled. The work of removing the Ferris wheel is under way, and the steam and electrical plant is offered for sale. F. DeL.

Chicago, December 2.

Damage by Lightning.

Writing to *Industries* Mr. A. A. Voysey gives an account of an apparently unusual cause of damage by lightning. In a room in a country house near Nottingham stood a table "ornamented by a fringe fastened securely to it by nails. This fringe had been almost entirely burnt on the side of the table facing the room, and the burning had partially extended to one other side. The wood was charred to a depth of one-eighth to one-quarter of an inch where the fringe was burnt. If the table had been struck by lightning there must have been some marks in the room showing where the discharge had entered and where it passed to the earth. But not a mark or sign of any kind could be found, and the damage to the table was completely isolated. A rigid inquiry proved that no one had entered the room with a candle. The only possible explanation of the occurrence was suggested by an examination of the fringe. It was found to consist of a fluffy material, probably a mixture of cotton and wool, and certainly of an inflammable nature. Interspersed among the fluffy material were fine metallic threads. Now it is in this combination of inflammable material with the metal threads that the explanation lies. The metal threads were acted on inductively by the lightning discharges taking place near the house. This inductive action was sufficient to cause small sparks to fly between various threads, and the sparks set the inflammable material on fire. If the fire caused in this peculiar manner had not quickly died out, the whole house might have been destroyed, and no sign would have been left to point to the true cause. It is not unusual for fires to occur in connection with thunder storms, and they are generally attributed to the direct action of a lightning discharge. Possibly a large percentage of such fires have been caused by induction, and the simple incident which has come to my notice is sufficient to show how easily the inductive action may cause a fire."

Wall Street and the Electrical Stock Market.

The Wilson tariff bill was the one topic of absorbing interest in Wall street this week. Its very drastic measures were logical in the effect which they produced on the industrial stocks, and seemingly illogical in their effect on the railroad list. The industrial securities, whose interests are affected by a reduction in the duty, responded almost immediately with lower prices, sugar leading the list. This indicated that the measure was more severe than had been generally supposed, and consequently had not been discounted. The advance in the railroad stocks which followed the publication was probably on the idea that an advance was overdue, and had been delayed on account of the uncertainty of the measures of the bill. The text becoming known there was nothing left to do but to put up the market. This is a most illogical conclusion to reach, but in Wall Street things are often logical because they are illogical. The real *bona fide* buying of the railroad stocks came from London, where the sentiment is decidedly in favor of the bill. It is not our province to discuss its measures in this article, or its probable effect upon the industries of the country. We do not believe that it has been before Wall street sufficiently long to be reflected in the movement of stock, but that the next week or two will be productive of a decided market sentiment in favor of or against the bill. Certain organs, pointing to the fact that certain stocks have gone down, reach the conclusion that it is bad for the interests of the country. Organs of the opposite faith cite the fact that the advance in certain stocks reflects a sentiment that the bill will be of advantage in the nation's interests. The industrial fabric is the basis of our prosperity. If this be rent in twain, prosperity will be destoyed. The intelligent reader must reach his own conclusion as to the results which will be felt by the various industries of the country if the bill becomes a law.

Bradstreet's and *Dun's* reports agree that the introduction of the tariff bill had a decidedly adverse effect on business. Industries reflect more clearly their waiting attitude, which is not conducive to a revival of activity. There was a slight reaction in wool, no improvement in iron, but a hand-to-mouth inquiry for cotton goods. The demand from different sections of the country for various goods is unusually light for this season, despite the accumulation of idle money.

In the stock market there was a continuation of the demand for the better class of investment securities which had the effect of advancing prices somewhat. The continued accumulation of money in the banks is the one controlling factor. The bank statement showed that a turn towards commercial activity had been made. The loans showed a decided increase, amounting to $4,228,400. The surplus showed a falling off as compared with the previous week, the increase being $5,261,725. Upon the publication of the statement the market hardened materially, and the tone at the close was decidedly bullish.

Western Union scored a material advance. We are told that the interests which carried the stock to 93⅞ in October has again taken an aggressive bull stand, and that they are in a stronger position than before. The foundation of the movement is undoubtedly the demand for investment stocks. The fact that Western Union investment holdings were not disturbed when the price was carried above par before, offers an additional incentive. It is said that the present programme is to carry it to par. The professional manipulators are being helped out by a good investment demand which comes from individual capitalists, New York savings banks and one or two insurance companies. The amount of stock held by brokers is said to be smaller than at any time for months. The lowest point reached during the period under review was 89½ on Monday. It touched 92 yesterday and to-day. The Collateral Trust's 5's on limited recorded transactions scored an advance, going to 107, that quotation being the last sale. We expect to see these bonds sell on a 4 per cent. basis.

General Electric has made another record for itself. At a meeting of the directors held in Boston this morning, the following resolution was adopted:

Whereas, The net manufacturing profits since the last dividend, ordinarily applicable to payment of dividends, are offset by necessary shrinkage in customers' account and other assets;

Resolved, That the cumulative dividend on the preferred stock be not declared at this time.

In this connection it is well to state that the dividend on the preferred stock is cumulative. Consequently it will eventually have to be paid. It is not earning the requisite amount now. This makes the resumption of dividends on the common stock the more remote. The amount of this preferred stock outstanding is $4,251,900. While it is preferred, it is not preferred as to assets. Its interest rate is seven per cent., payable semi-annually in January and July. The stock is not traded in on the New York Stock Exchange. In Boston it sold down to 62 on Monday and Tuesday, and back to 68 the day following. It dropped to 60 to-day on the announcement that the dividend was passed. There was no activity at this price.

The common stock in the New York market was weak all the week, as if aware of some impending disaster. It dropped from 38¼ to 36 on Monday, rallied to 38¾ and sold off to-day to 35½, when the passage of the dividend became known. There were a number of stories afloat during the week regarding the company and its future. One was to the effect that the Excelsior Company, which was absorbed by General Electric, and which manufactures a certain form of arc lights, would withdraw. We failed to obtain confirmation of this report. An executive officer of General Electric denied the probability of such action. The same authority said that the report that the Brush Company was about to withdraw from General Electric was false; that such action would be a physical impossibility, as General Electric owns control of the stock. The debenture 5's were in considerable demand around 74½ to 75.

Edison Illuminating, of Boston, has increased its capital stock from $2,671,300 to $3,000,000, giving each holder of 6½ shares one new share at par.

There were no sales of Edison Electric Illuminating during the week. There was some inquiry for the First 5's at 104 to 104½. North American was devoid of interest around 4¾ to 5. American Telegraph and Cable reflected the higher prices for Western Union, by whom it is guaranteed 5 per cent., selling at 87 and 88.

On the Boston Exchange, Bell Telephone on moderate transactions dropped from 188½ to 186½ and 187. Erie Telephone weakened on limited sales from 43 to 40½. New England Telephone was bid 55, at which figure sales took place. Fort Wayne Electric was bid 4; Westinghouse first preferred, 46; and the assenting, 24½ to 25.

New York, December 2.

The market opened weak this morning. During the first hour General Electric sold down to 33¾ and rallied to 34½. Western Union sold down to 89¾, at which figure it was at the end of the first hour.

New York, December 4.

PERSONAL.

Mr. Samuel Insull, president of the Chicago Edison Company, was in New York last week.

Mr. W. J. Morrison, of the Fort Wayne Electric Company, was in New York a few days ago.

Col. S. M. Bryan, the well-known telephone man, of Washington, D. C., was a recent New York visitor.

Mr. Wendell Baker, of the Chicago office of the American Telegraph and Telephone Company, has been transferred to the New York office of the same company. Many New York visitors to the World's Fair have reason to remember Mr. Baker's many courtesies.

Miss Florence Sands, daughter of Mr. J. W. Sands, secretary of the E. S. Greeley & Company, New York, was married to Mr. William Hamilton, of this city, on Tuesday, November 28. The wedding was at St. Thomas' Church, and was attended by the best people of New York.

Mr. Joseph A. Oudin, a well-known advertising agent of the *Times* Building, New York, is sending to his friends a series of unique cards in the various shapes of a football, the pyramids of Egypt, etc., on which the advantage of intelligent advertising is properly presented. Mr. Oudin is always original, full of ideas, and deserves the high position he has won in his exacting field.

Mr. J. J. Gates, formerly of the Mather Electric Company and the Perkins Lamp Company, is now the manager of the Connecticut Royal Arc Company, with headquarters at Hartford. Mr. Gates is an energetic and progressive young man, and has had the satisfaction, since he accepted this office, of closing a three years' contract with the Hartford Electric Light Company for the use of the Royal Arc Company's apparatus. His parent company is located in New York and licenses the Connecticut company.

Another prominent British consulting electrician has taken up his permanent residence in the United States. This time it is Prof. G. Forbes, and he has made Mills Building, New York, his business headquarters as a consulting electrical expert. He is a man that we can ill afford to lose, but all the same, we have very little doubt that he will frequently be with us on this side. A representative of the ELECTRICAL REVIEW, New York, reports an interview with him just prior to his present trip to this country.—*Electricity, London.*

A Telephonic Incident.

BY W. S. H.

John R. Smith was sitting in his New York office one day in the Fall of 1899. He had been taking it easy for a little while and had fallen into a reflective, contemplative mood little in keeping with his usually brisk and brusque manner.

Mr. Smith occupied an unique position in the commercial, political and intercontinental social world. If there ever could be a position uniquer than any other, he had an unclouded title to the same.

He had been for some months the chief operator of the great Intercontinental Telephone Company, with headquarters in New York and branch offices in London and Paris and at all the continental capitols, while the company's sub-stations were scattered all over the rest of the globe. It was Mr. Smith's particular business to serve the high and mighty dignitaries of the earth with telephonic facilities for that personal communication which had grown in the Summer of '99 to be such an important part of the business.

He was a young man with just the right linguistic attainments and was as skilful in his use of the tongues of the world as an elevated railroad conductor used to be in his use of the Queen's English. Indeed, it was said, that when it came to learning the pronunciation of the names of some of the potentates of the sphere, Mr. Smith had availed himself of the services of a certain red moustached conductor on the Manhattan who was never known to be understood but by one man, and he a Sanscrit professor who used to ride with this particular conductor as a matter of pronunciatory refreshment.

There was a sudden ring at the young man's elbow, a not unmusical ring from a gold-plated bell with a large and bewildering diamond upon its embossed top.

"Hello, there, Calcutta; what's that you say? Oh, I beg pardon, I thought it was Calcutta. Hello, St. Petersburg, hello; go ahead, St. Petersburg; how are you? Is that so? When'd it happen? Last night; been kept quiet until now? Well, well, that's tough, Pete. Smashed up the old man's best rig, eh? Well, there may be something in the world after all better than being a czar. How's that? The czar want's to talk with Wales, old boy? Hold on a minute, hold on there; wait a half a minute, can't you? There's somebody on this line wants to talk with Bill of Berlin—there, now, Lunnon; say, is Wales, his kinglets, in? No? Well, tell him his old enemy, the czar, has had a bad night. A nihilist, who'd just been returned from the United States got loose and blew the old man up about eight last night. No, no special harm done, a rib or two broken, nothing to speak of—for the czar. Wales's out of town, is he? When'd he go? This morning? All right; don't make much if any difference anyway; good old mother left things in apple pie order. So long, old man; see you later; good bye. Eh? What's that? When am I coming over? Well, maybe I'll take the next air ship; she leaves at 11. If I can get some of the boys to look after things, maybe I'll run in on you for lunch to-morrow, if I don't to-day. Good bye, old man; see you later."

Mr. Smith hung up his telephone and settled himself down in his chair and began ruminating where he left off when the interruption occurred. He had just gotten himself into trim for a good quiet time all by himself when the bell rang again, this time with a sharp, strong tingle.

"Hello, hello, hel-lo! Who-is-it-you-want? Who's that ringing this bell? Say, let up there; do you think this is a public exchange or a—well, well, now, if you don't quit that—ah, I beg pardon, it's Washington, is it? Is this you, Mr. Depew? How do you do, Mr. Depew; glad to see you; how's everything? What can I do for you this morning? You did? To-day? Well, well, that's good; and you read 'em the riot act, did you? What's that? Told 'em if they—tried—to—warm—over—the—Sherman—act—you'd—resign. Something don't work well with the wire; there, now, Mr. Depew, that's better. You want me to tell Harrison about it in London—all right, all right; but say, Mr. Depew—Doctor—Chauncey, old boy, I say, wait a minute till I ring him up—say there, who's that? Ah, Mr. Depew, now I get you; that's better. Won't you talk with Ben yourself? All right, there you are; go ahead."

And the suave young man left the president, and the minister he had once upon a time tried very eloquently to make president a second time, to a conversation which lasted some five or ten minutes. It was nearing lunch time. The representative of the Intercontinental Telephone Company never liked to wait for his meals. So he broke in on the conversation with:

"Sorry to interrupt you gentlemen, but I've got to eat. See you later. What? You're not through yet? Well, take three minutes more, and be quick about it."

The Intercontinental Telephone Company, it might be well to state in passing, had just acquired fee simple to 10 more States; had bought all but three legislatures, and was negotiating for the balance of Congress, though, as the president of the company languidly said, in one of his daily papers, it didn't make much difference to him whether he bought the rest of Congress or not; it was getting to be somewhat of a drug on the market.

Mr. Smith went out to lunch with a friend over in Philadelphia and came back with a comfortable sort of a sleepy, well-fed feeling which the air boat trip, always a gentle soporific, accentuated.

He found the office in a regular muddle. The assistant, who had been on duty in his absence, was a shade off in his Russian and his Spanish was more apt to crawl around in the short clothes of Ollendorf than in the more mature garb of Madrid. He had tried to get connection between Rome and Washington, as the Pope wanted to have a chat with the ablegate, and in the making of the connection, he got St. Petersburg and the Spanish capital all tangled up. Before help came he had nearly every wire on the potentate circuit jingling like mad. Grim old Li, who had hung onto life like a turtle to its bony hide, was chattering Chinese from Nankin; the stiff-backed young president of Greece, just in from looking after his fences up at Thermopolæ, was answering what he thought was a query as to a protectorate in a particularly pompous tone of voice; there was a mixture of onions and beer as a menial of the Berliner blustered a message from his master through a furzy pair of mustachios that caught up the gutterals and sent them on their way with the noise of a calliope in the last stages of pulmonic decay, and somebody from South Africa had tried to get in his oar in the interests of another Free State, which he was booming for continental consideration.

Things were in pretty much of a mess. But it didn't take long to straighten them out. Not when Mr. Smith was on deck.

In less than 10 minutes he had the whole crowd in good humor and was buying a corner lot in Jerusalem on the side from a friend who had just platted a new addition and was trying to unload.

Then he fell to ruminating again, and this time with more satisfaction to himself. In the next half hour he carried out what he had been trying to evolve all the forenoon—how he could clear the lines so that he might make connections with himself all the way around the world.

He caught the wire at an opportune moment, made all the connections in good shape, got a free line all the way round and there he sat with a look of charming repose upon his face, his mouth at the transmitter and the tube at his ear enjoying the supreme satisfaction of being the first man who had ever heard himself talk around the world.—*Minneapolis Journal.*

Electric Traction in Japan.

Application is being made to the authorities for power to construct an electric street railway in Tokio, Japan. Estimates have been prepared for the line by an engineer of the Osaka Electric Light Company. The proposed line will run from Shinagawa along Misa and terminate in front of the Imperial University, with a branch at Dobasti to Ryogokn. The total length of the lines will be about 39 miles, and the capital of the company is to be 1,400,000 yen.

Storage Batteries for Central Stations.*

BY C. O. MAILLOUX.

Since the report was read at Milwaukee, the writer has discovered therein a mistake, which is partly accounted for, if not altogether excused, by the limited time in which it was prepared, it having been, in fact, mostly written on the way to Milwaukee, owing to the delay experienced in receiving the data requisite from various sources.

By an error in pointing off decimals, the cost of a 1,300 kilowatt hour battery was wrongly given as $8,450, instead of $84,500. The saving figured out in that case, of course vanishes with the change, were it not for further corrections which can now properly be made, and which partly compensate this error. The abstracts of the paper published by the technical press have had the effect of waking up American battery manufacturers to a realizing sense of the importance of the results obtained in Europe, and of the necessity of their making efforts to prevent the European manufacturers from invading the field in this country. No less than three concerns have already informed the writer of their intention to immediately put large central station batteries on the market. In one case the writer was shown the plates in process of manufacture. The information obtained by the writer since the paper was read seems to show quite conclusively:

1st. That the cost of large central station batteries will not exceed $35 per kilowatt hour, set up, in most cases, and for smaller sizes will not exceed $50 per kilowatt hour.

2d. That the cost of maintenance will not exceed 10 per cent. of the initial cost.

3d. That the rate factor can be safely based on three hour discharge, or even less, in most cases, instead of four hour discharge, as assumed in the paper.

If we make use of these amended data, we find that not only the cost per unit of battery capacity, but the total capacity itself, can be reduced. In the case considered, the required capacity now becomes reduced to that determined by the quantity factor, instead of being determined by the rate factor (43 per cent. more); hence, a battery of 910 kilowatt hours capacity will be enough. This, at $35, will cost $31,850. The interest (6 per cent.) and the maintenance (10 per cent.) will make the annual cost $5,096. This is equivalent (for 365 days) to $13.96 per day. As the coal saved, in this case, was calculated to be 4.47 tons, it follows that the use of the storage battery would only pay if coal cost over $3.15 per ton, instead of $1.10, as given in the paper.

*An appendix to a report on this subject read at the twelfth annual meeting of the American Street Railway Association, October 18, 19 and 20, 1893.

Electricity in Gardening.

By the use of electric light the Hon. W. W. Rawson, of Arlington, Mass., claims that he makes a gain of five days in each of his three crops of lettuce—that is, two weeks in a season; that the gain on one crop pays all the expenses of the electric lighting for the season, thus giving him the gain on the other two for extra profit. His attention was first called to the usefulness of the light by the advance made in the growth at the ends of his green houses next the street and in the glare of the electric light. This was so marked that he introduced the light through his lettuce and cucumber houses. Dr. Baily, of Cornell University, says, as the result of his own experiments, that the influence of the light is greatly modified by the interposition of a glass roof. Plants injured by a naked light were benefited by the protected light. Five hours' light per night at a distance of 12 feet hastened maturity a week or 10 days, but proved injurious to young plants and those newly transplanted.

American Electric Launches in Italy.

Great excitement has been caused in Venice by the arrival of one of the electric launches from the World's Fair. The mayor and two aldermen of that city made a parade along the canals in this "strange" craft.

GENERAL NOTES.

After a hotly contested trial at Eagle Pass, Tex., of three days, in the case of the Canales heirs *vs.* the Texas Mexican Electric Light Company, trespass to try title, involving the land on which the light company has its valuable plant, the jury brought in a verdict for plaintiffs.

Ward Lewis has secured for the Great Barrington Electric Light Company, of Great Barrington, Mass., a lease of the water-power at the Glendale mills, and in a short time it is expected that an electric station, supplying light and power to all South Berkshire, will be in full operation there.

The Board of Electrical Control of New York decided, on November 23, that where electrical companies are ordered to remove poles and wires and fail to do so, the Board will remove them at the expense of the companies, refusing to issue a permit of any sort to any company until it has paid such expenses.

A trust mortgage for $1,000,000 from the Maryland Electric Company, of Baltimore, to the State Trust Company, of New York, was recorded on November 15. It is to secure the issue of 900 bonds of $1,000 each and 200 of $500 each by the electric company. The bonds are dated July 1, 1893, are payable July 1, 1923, in gold and bear six per cent. interest. The mortgage is secured by the property rights and franchises of the electric company.

The plant of the Haverhill and Amesbury street railway, between Newburyport and East Salisbury, is now equipped for electricity. The planking of the bridge has been completed, and Superintendent Wentworth, last week, had a gang of men making the necessary changes to the tracks in Newburyport, and stringing the overhead wires from the bridge to the trolley wire of the Newburyport and Amesbury railroad on Merrimac street. It was between three and four o'clock Saturday when the first electric car went through from East Salisbury to Newburyport.

Preparations are being made for a big meeting of those interested in the proposed electric railroad to be constructed from Washington to Falls Church by way of the town of Ballston, N. Y. Circulars printed in immense black letters have been distributed widely throughout the country across the aqueduct, calling upon the people to learn the plans of the company and to take a chance to become interested in the immediate building of the road. The committee in charge of the project say they have $40,000 already on hand. The entire cost of the construction, it is estimated, will be but $75,000.

A new trolley car guard, the invention of Sylvanus D. Wright, of New York, was tested on the Fifth avenue line of the Atlantic Avenue Railroad Company, in Brooklyn, on November 23. The new safety guard is made of wire and iron, and is firmly attached to the front and rear trucks of the cars. It covers the entire stretch of the track. In front is a wire frame called a trigger. The moment any obstruction on the roadbed comes in contact with the trigger the basket lowers while the wings fall outward. It is claimed by the inventor that it will prevent serious as well as fatal accidents on the trolley road. While the trial was being made bags filled with iron weighing nearly 200 pounds were successfully picked up in the safety basket.

A suit has been brought by Count Arthur Dillon, of Paris, against the Commercial Cable Company as a corporation and John W. Mackay and James Gordon Bennett, individually, for the recovery of $500,000 and interest since 1890. It is alleged that this sum represents the value of 266 shares of preferred stock which Count Dillon says were promised to him under an agreement for his services in furnishing valuable information and assistance in establishing the company and conducting its affairs. The only witnesses examined during the first day of the hearing before a referee were Count Dillon and Mr. Hector de Castro, who was one of the promotors of the company. It is stated that the defense would be a denial that the agreements referred to were made by Mr. Mackay.

Siemens' Resistance Measurer.

In a series of articles on "Practical Instruments for the Measurement of Electricity," by J. T. Niblett and J. T. Ewen, published in the London *Electrical Engineer*, is a description of a very ingenious modification of the differential galvanometer for the purpose of measuring resistances of varying magnitudes devised by the late Sir William Siemens. Its main features are that the readings are made by means of a vernier on an equally divided lineal or circular scale, on which each division signifies a unit of resistance; that only a single unalterable known resistance is required, with the occasional employment of another for purposes of comparison and calibration; and that, as in the ordinary differential galvanometer, the readings are totally independent of the deflection function of the instrument, the galvanometer needle being always brought back to its zero mark before a reading is taken.

The essential difference between this instrument and the ordinary differential galvanometer for measuring resistances is as follows: In the latter case the coils remain stationary, and the effect of the two currents on the needle are neutralized by altering the value of R_1, the known variable resistance, until the currents themselves are equal. The value of R, the resistance being measured, is then ascertained from the reading of R_1, which must be exactly equal to it.

In the Siemens instrument the value of R_1, and therefore of each of the two currents, remains constant during a measurement, and the effect of the two currents on the needle are neutralized by altering the position of the coils relatively to the needle until the effect of the stronger current, by reason of its greater distance from the needle, is just balanced by that of the weaker. The value of R in this case is ascertained by observing the position of the coils relatively to the needle.

The accompanying diagram illustrates the principles involved in the construction and use of this instrument. The swinging needle is suspended just as in the ordinary differential galvanometer with its center in the center-line of the two coils, and its indicating pointer clear of them. The two exactly similar coils C and C_1, instead of being fixed to the baseboard of the instrument, are rigidly mounted on a sliding-bar B E which has sufficient movement in the direction of its length to permit of either coil being brought up close to the swinging needle. The sliding-bar B E, which is supported on guide rollers, is provided with a pointed agate tip E which is kept continually pressing against the face of the inclined curve M N by means of a spring at the other end of the bar. Thus, if a downward motion is given to M N the sliding-bar and coils move to the left, and so bring the coil C_1 up towards the needle. If M N is moved upwards, then the spring causes the bar and coils to travel to the right, the agate point following the curve, so that the other coil C moves towards the needle.

The inclined curve M N slides against a scale graduated in equal divisions, and is provided with a vernier to read to tenths of a scale division. The transverse motion of M N is obtained by means of a rack and pinion, as shown in the illustration.

The whole apparatus is mounted on a horizontal metal table supported by three leveling screws. The two coils, the suspended magnet, and the scale for observing the zero of the pointer, are all contained within a glass case, outside of which are a contact maker, K, for making and breaking the circuit, and six terminals—two for the battery connections and four for coupling up the known and unknown resistances, R_1 and R. The connections are arranged so that the battery current is divided between two circuits as shown. One circuit contains the coil C_1 and the known resistance R_1, and the other contains the coil C and the unknown resistance R. In each of these two circuits is placed a current interrupter in the form of a plug, to allow of either or both circuits being readily broken when desired.

The calibration of the instrument consists mainly in determining the correct form of the curved surface M N. Theoretically, this could be obtained by calculation, using Weber's formula for the moment exerted by a current of known strength in a circular conductor, upon a freely suspended magnetic needle, but owing to the difficulties of constructing the coils accurately and of obtaining all the necessary data with sufficient exactitude, it is preferable to determine the form of the curve for each separate instrument empirically. To do this a carefully calibrated resistance box or rheostat is connected between the terminals provided for the unknown resistance, and a succession of positions of the agate point E are obtained, each corresponding to no deflection of the galvanometer needle for a different value of R. These positions are next marked off on the sliding-piece, to which successive transverse motions are given so as to make the scale readings correspond with the successive values of R; and the required curve M N is then drawn through the succession of points thus obtained. In practice Sir William Siemens used a similar method of calibration to this.

In addition to the single fixed known resistance R_1, which always accompanies this instrument, a second known resistance is generally supplied, so that check readings may be taken from time to time for the purpose of testing the accuracy of the instrument. This second known resistance is also extremely useful for readjusting the zero point after the instrument has been altered in any way, or if a new silk fibre suspension for the needle has been put in.

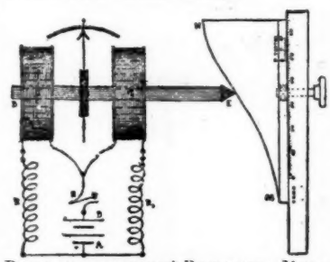


DIAGRAM OF SIEMENS' RESISTANCE MEASURER WITH CONNECTIONS.

In practice the manipulation of the instrument is extremely simple. R, the resistance to be measured, is connected up between the terminals as shown, and the sliding-piece, M N, is moved transversely by means of the rack and pinion until the closing of the contact-maker, K, causes no deflection of the galvanometer needle. The resistance of R in ohms is then read off directly from the fixed scale with the aid of the vernier on M N.

The device for adjusting the position of the coils can also be made so that the fixed scale and the sliding-piece, M N, instead of being flat, as in the instrument illustrated, form part of the surface of a cylinder. A turning instead of a sliding motion must, of course, be given to M N in this case.

This instrument excels the ordinary forms of Wheatstone's bridge both in accuracy and range, besides being cheaper and much more portable. Both the range and the sensibility of the instrument can be varied within very wide limits by altering the dimensions of the coils and the form of the curved surface M N. It has been found of great utility for the reading of resistance thermometers—that is, thermometers which depend for their readings on the variation of the electrical resistance of wires exposed to the temperatures being measured; and it has also been found of service, before the days of testing-sets, for the measurement of the wire resistance of overland lines.

A Trans-Pacific Cable.

The new proposal of Sanford Fleming for a trans-pacific cable, which he intends submitting to the Canadian and Australian governments, contains four alternate routes, all of which will have Vancouver as the Canadian terminus. The length of the shortest route, including branches, would be 6,224, and of the longest 8,264, nautical miles. The cost of the former is estimated at £1,380,000; of the latter £1,825,000.

Popularity of the Interior Conduit Company's System.

Illustrating the increasing demand and the popularity of the Interior Conduit and Insulation Company's system of interior conduits, the Central Electric Company, who are the exclusive general Western agents, state that the great buildings of Chicago that have been constructed in the past season, with no exception to speak of, have been equipped with the Conduit Company's tubing, the list being made up of:

Title and Trust Building, 100 Washington street	3,000 lights.
LaKota Hotel, Thirtieth and Michigan avenue	3,000 "
Illinois Central Railway Depot.	4,300 incandescent and 74 arc lamps.
Teutonic Building, Fifth avenue and Washington street	1,900 lights.
A. W. Sullivan's residence	
Dr. Frank S. Johnson's residence, 2542 Prairie avenue	
Chicago Athletic Building	3,100 "
Columbus Memorial Building	4,000 "
New Era Building	1,790 "
New York Life Building	2,800 "
Windemere Hotel	3,000 "
W. A. Dunchee's large apartment building	1,000 "
Congress Hotel	7,300 "

Among the buildings now under process of construction, the specifications of which call for interior conduit, are the

Chicago Stock Exchange Building	5,500 lights.
Marquette Building	4,000 "

In fact, it is rarely the case where a large building is put up in Chicago that the interior conduit system is not used.

The Central Electric Company also state that conduit is being called for in the specifications of architects throughout their territory and in the most out of the way places. In addition to the buildings enumerated, the leading central stations of Chicago have used conduit largely in carrying in their circuit wires.

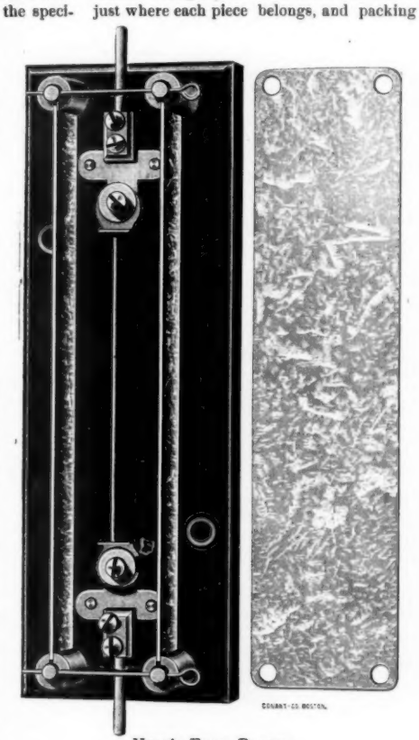
LITERARY.

The Forum, which its readers regard as the foremost of our periodicals, reduces its price, beginning with the December number, from $5 to $3 a year, from 50 cents to 25 cents a copy. This is the most noteworthy reduction in periodical literature that has taken place—perhaps that can take place. Magazines of fiction and adventure, the illustrated monthlies, were within everybody's reach even before the recent reduction in the price of some of them. But no periodical of the class of *The Forum* has ever been sold for 25 cents. It becomes the cheapest by half of all great Reviews in the world, and it remains the largest of all our periodicals of its kind, and its character is in no way changed. This reduction of price puts *The Forum* easily within the reach of every reader who cares for it—of every man and woman who desires to keep abreast of the times. The extent to which this reduction will add to popular education on great subjects is incalculable. The ablest articles by the foremost writers are now offered at less than two cents each. The December number, for example, contains the following 16 articles: "Are Presidential Appointments for Sale?" William D. Foulke; "Necessity for Immediate Tariff Reduction," A. Augustus Healy; "A Plan for an Automatic, non-Political Tariff," Hon. W. J. Coombs; "Francis Parkman and his Work," Julius H. Ward; "Child-Study: the Basis of Exact Education," President G. Stanley Hall; "Israel Among the Nations," W. E. H. Lecky; "The Beginning of Man and the Age of the Race," Dr. D. G. Brinton; "Need not of 'More Money,' but Better Exchange," T. G. Shearman; "How to Deal with a Filibustering Minority," John B. McMaster; "Use of Rich Men in a Republic," Frederic Harrison; "Mr. Goldwin Smith's 'Views' on our History," Woodrow Wilson; "A Plan to Free our Schools from Politics," Dr. J. M. Rice; "The Most Popular Novels in America," Hamilton W. Mabie; "Lasting Results of the World's Fair," Alice Freeman Palmer; "The Fair's Results to the City of Chicago," Franklin H. Head.—*The Forum Publishing Company, New York.*

A New Fuse Block.

The demand for a light, compact, covered fuse block for use on 500 volt circuits has been steadily increasing for some time past, and in an endeavor to meet these requirements, the W. S. Hill Electric Company, of Boston, Mass., have recently perfected and put on the market an article of this description, which we believe is destined to become very popular. The box, as shown in our illustration, is compact and well constructed. The metal terminal blocks are mounted on a slate base, and the parts are all protected by a mica box, the removable cover of which is held in place by two wire pins, and can be readily removed to permit of replacing a blown fuse.

The W. S. Hill Company, in putting this block on the market, have done so with a thorough understanding of the practical requirements of the service, and it may be depended upon to fulfill them.



HILL'S FUSE BLOCK.

A Monster Engine for the Edison Illuminating Company of New York.

The Dickson Manufacturing Company, of Scranton, Pa., has just completed a monster engine for the Edison Illuminating Company of New York city. The engine weighs 400,000 pounds and is of 2,500 horse-power. It required about one year to put this great piece of mechanism together, and now employés of the company are taking it apart, marking each portion so that the machinists who set the engine up in the plant of the Edison Company in New York will know just where each piece belongs, and packing in boxes the smaller parts of the engine. It is thought that the engine will be ready for shipment very soon.

The engine is what is known as a quadruple expansion engine of the Van Vleck pattern. It has two crank tandem cylinders, one of high pressure and one of low pressure. The dimensions of these cylinders are 26x37, 52 and 72x36. The engine will be capable of making 90 revolutions a minute. The gearing is what is known as Joy valve gearing, with piston valves controlled by hydraulic governors. The crank shaft is a steel forging and weighs, of itself, 30,000 pounds. Armatures are to be placed on each end of this shaft when the engine is placed in position in the electric light works.

This is the first engine of the kind built in Scranton, and surpasses the other engines built here for the Edison Company. It will require a large force of men from the Dickson works to set up the engine in New York city, and that work will be completed before the middle of December.

Andreoli's Experimental Apparatus For Producing Electrolytic Caustic and Bleach.

The electrolytic plant described herewith, and which has been devised by Mr. E. Andreoli, who operates it at Bethnal Green, England, is not merely intended for the production of chlorine and caustic soda, as, with a few modifications and by using special anodes, Mr. Andreoli can adapt it to the manufacture of chlorates, or of oxygen and hydrogen, etc. Mr. Andreoli has kindly supplied the ELECTRICAL REVIEW with the accompanying illustration and the following description of the plant:

In the electrolytic apparatus, the porous diaphragm used is made of powdered asbestos, which, baked at a very high temperature, gives an exceedingly porous porcelain, presenting the advantages of offering less electrical resistance, when saturated with brine, than the ordinary porous clay porcelain, besides not being disintegrated like the latter, which swells and cracks very quickly when used in a tank for the preparation of chlorine and soda.

The use of this asbestos porous porcelain, in electrolyzing salts, ensures the total separation of the anolyte and catholyte, which, being charged respectively with chlorine and caustic soda solution, do not intermingle, thus causing losses by recombination and formation of other salts, such as chlorates, etc., which are uselessly electrolyzed, and further diminish the efficiency of the electrolytic operation. To maintain the yield of chlorine and caustic soda, Mr. Andreoli's tanks are constructed so that both anolyte and catholyte are continually circulated by pumps and cooled, and, if necessary, strengthened by the addition of salt in their passage from one tank to the other.

The anodes used are of dense retort carbon, which is cut into slabs of about 14 inches by six inches. Generally, retort carbon cannot be obtained in large slabs, and is, therefore, practically unavailable. It is, also, always difficult to connect the carbon anodes together without exposing the metallic contacts to corrosion by chlorine and oxygen; but Mr. Andreoli's tanks being shallow, it is easy to find pieces long enough to touch the bottom. The slabs of carbon at their top corner have two shoulders leaving a protuding piece, which, after being trimmed, is fitted in a hole cut in the slate lid of the positive compartment. A groove is cut in the upper part of the anode, the top of which is coppered and tinned, and the contact bar is fixed on it. Round the groove a paraffined string or cord prevents the carbon from being loose, and, also, the escape of gas from the positive compartment. To increase the conductivity of the anodes two or three holes are drilled vertically down the slab three inches deep, a copper rod is dropped in and the hole is filled by pouring in molten lead.

The cathodes are plain iron plates with holes punched in them to insure a perfect circulation of the alkaline liquor.

To diminish as much as possible the electrical resistance of the tanks, the anodes and cathodes are placed as close to the porous diaphragm as possible, so that except at the ends of the tanks each compartment has two sets of anodes and cathodes; on the side facing the porous diaphragms and the cathodes, the carbon pieces are carefully ground.

There are several modes of constructing extremely simple and cheap tanks; at Bethnal Green the following model has been adopted for the demonstration of the production of chlorine gas and caustic soda; these tanks have been designed by Mr. Cornelius Hanbury. They are made with two transverse chambers. Our illustration shows two electrolyzers united together by two slate caissons, through which, respectively, flow the chlorinated electrolyte of the positive compartments and the alkaline electrolyte of the negative compartment.

The tanks are not deep, so as to facilitate the construction and the arrangement of the carbon anodes in their compartments, but they may be as long as desired.

Near the two opposite ends, partitions are fixed, cutting of two narrow transverse chambers; between these partitions, and at right angles to them, porous diaphragms, each with an anode and a cathode very close to it, are fixed so as to form narrow water-tight compartments, which contain alternately, except in the first and last, two positive and two negative electrodes respectively. Each of these transverse chambers is divided into two, an upper and a lower one, by a horizontal partition fixed and made water-tight at about one-third of the way up from the bottom. Thus, for instance, the upper chamber on the left side will be a positive chamber, and that on the right will be a negative; while the lower chamber on the left will be a negative, the one on the right being a positive. This means that the liquid in the positive chambers goes to or comes from the positive compartments, and the negative chambers will contain the liquid which goes to or comes from the negative compartments. These transverse chambers are devised to feed the positive and negative compartments, and, also, to collect the liquid and gaseous products, and to maintain the circulation of the electrolyte.

In the space corresponding to every other compartment, a free aperture is made near the top of the partition at one end of the tank, the lower edge of which dips just below the intended level of the electrolyte, and the partition at the other end is similarly perforated near the top in the spaces corresponding to the other alternate compartments.

At the bottom of each transverse partition, free openings are made between alternate compartments and the lower transverse chambers, the openings in this lower series alternating with the openings in the upper series. Each compartment is shut in by a closely fitting cover. At one end of each of the upper transverse chambers an opening is made through which the gas evolved is drawn off.

To each upper transverse chamber a pump is attached, which forces the electrolyte through a pipe to the corresponding lower transverse chamber at the other end or side of the tank.

A similar result may be obtained by not subdividing the transverse chambers into upper and lower ones by horizontal partitions, but substituting for the lower transverse chambers, pipes continued from the pumps and connected to the positive and negative compartments respectively.

The characteristic novelty of this tank is that it constitutes a perfect *ensemble* in which works a double circulation of liquids, which, instead of being sent as usual into special cisterns, whence they are forced into the compartments of the electrolytic apparatus, constantly circulate from the inlet to the outlet of each series of positive and negative compartments. It will be seen from this description that the solution, passing from the feeding tank, flows through two pipes into the two lower transverse chambers, filling the positive and negative compartments till they reach the level of the upper openings mentioned above, through which the liquid overflows into the upper transverse chambers. The electric current is then made to pass through the electrolyte, the pumps connected to the upper transverse chambers are set in motion, drawing off the solutions, forcing them through the pipes and through the vessel in which they may be strengthened with fresh salt and cooled, and from there into the corresponding lower transverse chambers (either of the same tank or the next in succession) again thence to repeat the same cycle.

Above the surface of the electrolyte in the positive compartments, and the upper positive transverse chamber with which they communicate, chlorine accumulates and is drawn off at one end of the upper positive transverse chamber through a pipe, or from any other convenient spot.

Hydrogen is liberated from the surface of the electrolyte in the negative compartments and is drawn off through a pipe near one end of the upper negative transverse chamber or from any other convenient spot, and the solution of caustic soda, when sufficiently strong, can be drawn off from a pipe at the bottom of the same upper negative transverse chamber.

The two tanks which have been fitted up as a model installation at Bethnal Green, are considered by Mr. Andreoli as quite sufficient to demonstrate the efficiency of the process.

On the right of the illustration is seen an Elwell-Parker 10 volts and 800 amperes dynamo. The engine on the left is used for driving the anolyte and the chlorine gas pumps, and also the stirrers in the two wooden tubs behind the tanks. These tubs are filled with milk of lime to absorb the chlorine pumped from the anode compartments by the ebonite pump next to them. Mr. Andreoli absorbs the chlorine in milk of lime so as to be able to check the amount of chloride of lime formed at any time during the operation, as absorption in the dry lime would involve too much time when making experimental runs of the apparatus, which means a reading every five or 10 minutes, and a double analysis of samples of the chlorine and soda solutions. It is obvious that the chlorine could be absorbed in the dry state just as well; it is drawn off from the top of the upper transverse chamber through an earthenware pipe.

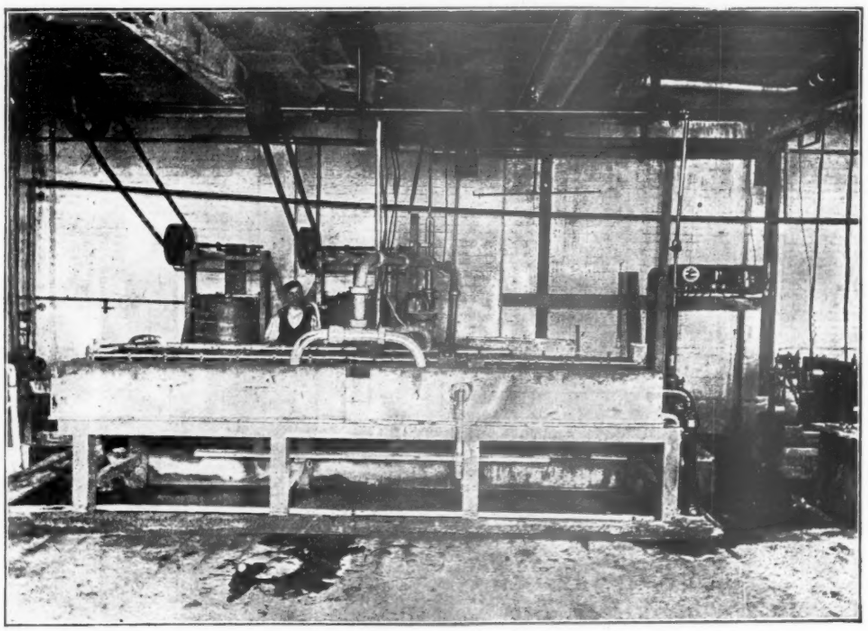
The hydrogen evolved in the operation collects on the opposite side of the tank, and is, for the present, led out to the open air by pipes. The anolyte is circulated by means of a Doulton earthenware acid pump, and is forced through a series of drain pipes lying in running water, thus constantly cooling the chlorinated liquid. The catholyte is circulated by a small steam pump which is situated near the engine.

The two boxes at the ends of the tanks are placed over a small hole in the lid of the end anode compartment, and are filled with lime, so that if, at any time, the chlorine pump is stopped for a moment, by accident or otherwise, the chlorine gas passes through them and is absorbed until the pumps start again.

The advantages claimed in favor of this electrolytic plant, apart from those which secure the special construction and arrangement of tanks in which the circulation, the temperature, and the density of the liquid are properly maintained, are:

That the retort carbon anodes, made of a single piece, offer a very large surface, and, after they have been submitted to a previous special treatment, do not present any metallic part which may be corroded. That the porous asbestos or similar porcelain causes only a very small resistance, is not readily attacked by chlorine and caustic, and that, moreover, there is no chlorine in the negative compartment and no soda in the positive compartment. That the electro-motive force required is low, owing to the special qualities of the porous diaphragms fixed on slate frames, between and close to an anode and a cathode, so that in each positive compartment there are two anodes, each facing the porous diaphragm, and in each negative compartment two negative electrodes, thus securing a good conductibility.

Further improvements in the construction of tanks, as well as of some new diaphragms, and the general system for the economical production of chlorine and pure caustic soda, and also of chlorates, etc., have been patented by Mr. Andreoli.



ANDREOLI'S EXPERIMENTAL ELECTROLYTIC APPARATUS AT BETHNAL GREEN, ENGLAND.

Dined in the Chimney.

One hundred and eight men enjoyed a good dinner on November 25, within the walls of the base of the greatest chimney in the world. The dinner was given in honor of the completion of the work. The chimney is the most conspicuous portion of the incomplete power house of the Brooklyn City Railroad Company, at the foot of Division avenue, Williamsburg, N. Y. A long table reached from the end of one flue to the other on the opposite side. The semi-circular recesses in the middle held extra tables. The firebrick walls were decorated with the Stars and Stripes. Incandescent electric lamps were suspended overhead. Chinese lanterns lent a festal air to the scene. The chimney is 300 feet high, the highest in New York, and one of the highest in the world. It has a greater cubic capacity, however, than any other, and is intended to supply the draught for boilers aggregating 18,000 horse-power. The chimney proper has an inside diameter of 17 feet, and has walls averaging three and one-half feet in thickness. It is 60 feet square across the base, outside measurement, and tapers to a diameter of 27 feet at the top, which is crowned with an iron cap weighing five tons. The weather surface is faced with pressed brick, the backing is North river brick, and inside, running from the base to a height of 75 feet, is a lining of firebrick. The chimney cost $60,000.

A Large Power Plant for South Africa.

In April last the Gold Mining and Exploration Company of Pietermaritzburg, Natal, and London, invited proposals for the supply and erection of certain machinery, plant, etc., for the purposes of generating and transmitting 250 horse-power by electricity to the works of various sub-companies in the district of the company's estate near Barberton near South Africa, the water power of the Queen's River being utilized. We are glad to learn that while the contract for the supply and erection of the electrical plant has been secured by a British firm, Messrs. W. T. Goolden & Company, London, the contract for the supply of the turbines has been secured by an American firm, the Pelton Water Wheel Company, of San Francisco. The turbines, of which there will be four, each of 125 horse-power, will work under a head of 142 feet. The turbine wheels are 72 inches in diameter, and are intended to work at a speed of 150 revolutions per minute, the generators being connected to the turbines by rope gearing. The power will be transmitted electrically from the power station to various mines situated within a distance of 10 miles.

Factory Inspector Connolly, of New York, has received a letter from President Eckert, of the Western Union Telegraph Company, saying that the company will resume the payment of its employés weekly.

ADVANCE INFORMATION.

New Electric Companies Formed and Important Constructions Projected.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week.

Electric Light and Power.

ST. PAUL, MINN.—Articles of incorporation of the Midway Electric Light Company, with a capital of $30,000, have been filed with the Secretary of State.

GEORGETOWN, TEXAS. — A company has been organized and plans about perfected for putting in an electric light plant in this city. The enterprise has been under discussion for some time, and a few days ago the charter of the company was filed with the Secretary of State.

NEW HAVEN, CONN.—The New Haven Automatic Lighting Company has been formed with a capital of $10,000, divided into 400 shares, all of which have been paid in. The subscribers to the stock are: John L. Williams, trustee; Frank L. Wallace and Lyman T. Lawton.

BROOKLYN, N. Y.—The Brooklyn, Queens County and Suburban Railroad Company was incorporated recently with the Secretary of State with a capital of $15,000,000. The company's principal office will be in Newtown, and a street surface road about five and one-quarter miles in length will be constructed in Queens County. Its termini will be as follows: Route No. 1—Middle Village and Corona Park, in the town of Newtown. Route No. 2—Middle Villiage and the town line of the towns of Newtown and Jamaica, where the town line is intersected by Metropolitan avenue. The directors are Frank Bailey, Edward Johnson, George H. Southard, Henry E. Hutchinson, Frederick T. Aldridge and Julian Fairchild, of Brooklyn; Cassius M. Wicker and Francis P. Lowey, of New York city, and Henry T. Bragg, of Yonkers.

WILLIAMSPORT, PA.—The Kane Electric Light Company has organized, officers elected, and work will be commenced at once. Council has granted permission to erect poles for the wires, 1,000 lights to be burning prior to Christmas. Three dynamos with 1,100 candle-power each, driven by 124 horse-power, will be used.

SAN FRANCISCO, CAL.—The Hough Electric Company has incorporated. Directors, Edward S. Hough, Jos. Hough, Ernest Hough, Le Roy G. Harvey, John M. Beck, Howard E. Wright and C. L. Dingley, Jr. Capital, $1,000,000, of which $350 has been subscribed.

MARTINSVILLE, IND. — The Martinsville Electric Light and Power Company's plant has been sold at receiver's sale for $9,700 to the Eddy Company, of Windsor, Conn., and the Thompson-Houston Company, of Cincinnati, which held mortgages on the machinery.

New Telephone Companies.

WAUCONDA, ILL. — Wauconda Telegraph and Telephone Company, at Wauconda; capital, $2,500. Incorporators, A. J. Coykendall, Robert Harrison and others.

CONCORD, N. H.—The Contoocook Valley Telephone Company has filed articles of incorporation at the office of Secretary of State, with a capital of $5,000.

The National Company, of Eau Claire.

It is reported that Mr. A. L. Ide, the well-known engine builder and central station manager, has secured a controlling interest in the National Company, and will dictate its management. The outcome of this movement will be watched with interest by both engine builders and dynamo manufacturers, while the purchasers will smile at the fairy tales of narrow minded representatives of engine builders who will decry the National apparatus, and of fresh agents for lighting apparatus whose watchword will be: Anything to beat the Ideal engine. Mr. Ide has made a success of previous undertakings, and there is no reason to doubt that the same common sense ideas will be applied in the present case, and that before three months have passed the National apparatus will have gained its former high standing.

St. Louis Insurance Rules.

The St. Louis Board of Fire Underwriters abolished the combination fixture cut-out on November 15, and directed "that all circuits hereafter placed and intended to be used for combination fixture wiring be so proportioned that the fuse in the branch block of the circuit will protect the smaller wires of the fixture. No fixture to be wired with less than No. 16 wire, B. & S. gauge." A second rule reads "Insulating joints to be approved must be made of material that will resist the action of illuminating gases, and will not give way or soften under the heat of an ordinary gas flame. They shall be so arranged that a deposit of moisture will not destroy the insulating effect, and shall have an insulating resistance of 250,000 ohms between the gas pipe attachments, and be sufficiently strong to resist the strain they will be liable to in attachment."

A New Trans-Atlantic Cable.

Messrs. Siemens Bros. & Company, of London, have been entrusted with a contract for a new Atlantic cable for the Commercial Cable Company, to be laid between Ireland and Nova Scotia next Spring. The cable will be 2,200 miles long, and will be of special strength to resist ships' anchors in fishing waters.

The extent to which the electric light is used in New York city may be judged by the fact that more incandescent lights are supplied by one illuminating company in New York than are used in the whole city of London. And we haven't nearly enough light yet.

The Christmas number of *Scribner's Magazine* contains five short stories of unusual beauty in sentiment, especially chosen for their apropriateness to the Christmas season. The authors are Robert Grant, Thomas Nelson Page, Henry Van Dyke, Edith Wharton and Herbert D. Ward.

The decision in the Novak lamp case will be awaited with interest. The patented processes of the company have been pronounced by eminent experts as not infringing the Edison patents. The complainant will claim, we understand, that these processes are not followed in the manufacture of the lamp and hence there is infringement.

The Indian and the Wire.

A contemporary from a dead and dreary Southern city declares that since the weather has grown warmer the town has been overrun with hatless and shoeless Papago bucks, who seemed to delight in loafing in the most frequented places and take a languid interest in whatever is going on.

A couple of them were recently indolently watching the stringing of the electric light wires in the vicinity of the Post Office, when one of the ropes by which they are hauled taut broke. The end of the wire, flying back and crossing other wires, received quite a current of electricity.

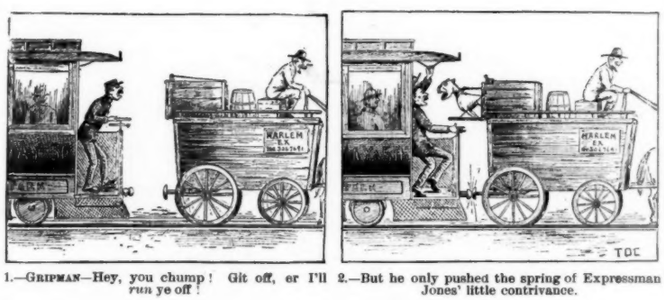
One of the bucks started across the street and, reaching the innocent rope of bright copper, happened to place one bare foot upon it.

He gave a quick hop without uttering any sound and carefully examined his sole. He then cautiously approached the wire, daintily touched it with his toe, and immediately gave another jump.

By this time his companion had joined him, and upon invitation put his foot squarely upon it, and was in turn intensely mystified. Both then suddenly recollected themselves. Gazing around at the number of spectators, and seeing their proceeding had been observed and evidently enjoyed, they quickly walked off to talk the mystery over in the neighboring corral.

A WARNING TO MOTORMEN.

[*From Truth.*]



1.—GRIPMAN—Hey, you chump! Git off, or I'll *run* ye off! 2.—But he only pushed the spring of Expressman Jones' little contrivance.

The Handsomest Train in the World.

The prize train of the Wagner Palace Car Company, which was brought on from Chicago and placed on exhibition in the principal cities along the New York Central, together with the famous engine "Queen Empress" and train of the London and Northwestern Railway, of England, "No. 999," the great record breaker and the old DeWitt Clinton, is more sumptuous and costly than any train ever built for king or queen. It can be safely said that its like has never been seen in this country or any other. Examination of this train will probably prove a revelation to many of our people of the possibilities of railroad car construction. The New York Central ran excursions at cheap rates from convenient points, so that all through the country the people had an opportunity to enjoy this highly interesting exhibition.

A Western Poet Tries the Telephone Girl.

It doesn't always follow
That because a girl has "rings"
And a multitude of callers,
She has, tied to apron strings,
Scores of men whose hearts are aching
To embrace her as their own—
For example, there's the "central" girl
Who runs the telephone.

—*Kansas City Journal.*

Prices of American Institute of Electrical Engineers' Badges.

The badges provided for the members of the American Institute of Electrical Engineers, illustrated in the ELECTRICAL REVIEW for November 29, may be obtained of Secretary Ralph W. Pope at the following prices:

Pin, lapel button, scarf pin, and watch charm, $3; single locket, $8, and double locket, $10.

Postmaster Henry L. Storke, of Auburn, N. Y.

THIS WELL-KNOWN TELEPHONE MAN RECEIVES AN IMPORTANT APPOINTMENT.

Mr. Henry Laurens Storke, who is well known to the electrical fraternity, especially in the telephone field, was last week appointed postmaster of Auburn, N. Y., by President Cleveland. The appointment has received the approval of local Republicans and Democrats alike, and is considered one of the best that the Cleveland administration has made. Mr. Storke has lived in Auburn, a city of about 30,000 inhabitants, for many years and has a beautiful house there.

Mr. Storke has been a newspaper man and is one of the pioneers in telephone history. In the Spring of 1879, while associated in the publication of the *Daily Bulletin* and *Morning News*, at Auburn, N. Y., Mr. Storke investigated the workings of the telephone, then assuming a commercial value, and was offered the assistant general managership of the Western Union and Gold and Stock Telegraph Companies. During the two years following the termination of the contest between the National Bell Telephone Company and the Western Union telephone interests, which occurred on November 10, 1879, Mr. Storke, in connection with Mr. T. B. Doolittle, of the Bell Company, was engaged in settling up complicated matters connected with the transfer of telephone properties conveyed by the agreement of November 10. He was also interested in the management of the Private Line Department of the Gold and Stock Telegraph Company and in the promotion of the telephone business under licenses from the Bell Company. Mr. Storke was the first treasurer of the Bell Telephone Company, of Missouri, and had large interests in it. During this time he and others developed telephone properties in Chili, which grew into the West Coast Telephone Company, which was transferred to an English syndicate about three years ago.

Upon retiring from the Gold and Stock Telegraph Company, Mr. Storke sold his interest in the Bell Telephone Company, of Missouri, and from that time devoted his entire energies to the telephone business in New York State. In association with others he organized, successively, the Empire State Telephone and Telegraph Company, with headquarters at Auburn, the Central New York Telephone and Telegraph Company, the New York and Pennsylvania Telephone and Telegraph Company, and finally the Hudson River Telephone Company. Mr. Storke was active in the organization of the National Telephone Exchange Association, and was its treasurer from 1884 until the association was disbanded.

A Valuable Device.

Messrs. Cushing & Morse, general western agents for Day's Kerite wires and cables, 225 Dearborn street, Chicago, are distributing to the trade and friends a new device for determining at sight the sized wire required for any number of incandescent lamps any distance from point of distribution. It is not a cumbersome book of tables, but consists of two cardboard disks on a single pivot. You simply multiply the distance by the number of lamps, the result is the number of lamp feet. You then turn your disk to the nearest corresponding number, and the sized wire wanted at any percentage of loss, is at once indicated. As there may be many persons in their territory whom they unintentionally have overlooked, they desire that all such send their address to them and they will receive this really valuable article.

Mr. Sunny and Mr. Kilbourne.

Mr. E. A. Kilbourne, formerly in the General Electric Company's employ, has been so free with his threats to do bodily injury to Mr. B. E. Sunny, of Chicago, that the latter found it necessary to have Kilbourne arrested and placed under peace bonds. Kilbourne claimed that because he exposed a shortage in the accounts of one of the local employés, he was discharged and not paid the full salary due him. Naturally this is denied, and the statement made that Kilbourne has been endeavoring to peddle his story among the newspapers for some time past.

KINDRED INTERESTS

The Consolidated Car Heating Company, of Albany, N. Y., are having marked success with their heater. A representative of the ELECTRICAL REVIEW had the pleasure during the recent cold snap in the West to warm his heels against their heater with great satisfaction. There is a large field for so good an article.

The Central Electric Company, Chicago, report large sales on the various grades of P. and B. paints and varnishes, which they are handling as general Western agents for the Standard Paint Company. Their stock represents the different grades of these products put up in packages ranging from one gallon to a barrel.

Mr. Jas. W. Eager, of the Onondaga Dynamo Company, of Syracuse, N. Y., reports that business with his concern is improving. They have recently secured the contract to light the Remington typewriter plant at Ilion, N. Y. The Onondaga machine has been unusually successful in several large stores in Syracuse and vicinity.

The E. G. Bernard Company are the representative electrical concern of Troy, N. Y., and Mr. Bernard found time recently to show an ELECTRICAL REVIEW representative his well ordered establishment. This store is centrally located and is replete with a large stock of electrical supplies. The company has recently enlarged its factory and is about to introduce several new specialties.

The Metropolitan Electric Company, Chicago, are receiving a great many orders for the Paiste adjustable clutch for T.-H. arc lamps. This is claimed to be the only clutch that can be adjusted to the carbon rod and never wear out. They are also selling the Paiste lower contact bushing for T.-H. arc lamps. This bushing insures a perfect contact to the carbon rod without the aid of small brushes.

The Ries Electric Specialty Company, of Baltimore, Md., the manufacturers of the well-known Ries regulating sockets and switches, have removed their offices and factory from their old quarters at the corner of Baltimore and Eutaw streets, to the large and commodious Gunther block, No. 7 South Gay street, where they have installed additional machinery, and will have ample room and largely increased facilities for manufacturing the goods which their growing trade demands. In addition to its established products, the Ries Electric Specialty Company is now busily engaged in manufacturing the new Ries & Scott single phase alternating current motors, for which the company has numerous orders already booked for early delivery. The smaller sizes of these motors will shortly be ready for the market, and will be rapidly followed by others of larger capacity, and will give a decided impetus to the introduction of motors on alternating current circuits.

The National Feed Water Heater which has had for the last 10 years an unprecedented sale among steam users, was exhibited at the World's Fair in the Machinery Department in operation with boilers and engine. The record of heating was remarkable and earned for this heater the highest award, a gold medal and diploma. Among the recent sales of this heater are five, aggregating 2,000 horse-power, to the Electric Light and Power Company, Syracuse, N. Y.; 800 horse-power to the Atlantic Improvement Company, Long Island; 1,000 horse-power to the Union Street Railway Company, New Bedford, Mass.; 600 horse-power to Halifax, N. S.; 500 horse-power to Boston Rubber Shoe Company; 800 horse-power to Harris Woolen Company, Woonsocket, R. I.; 2,000 horse-power to American Linen Company, Fall River; 300 horse-power to Edison Electric Illuminating Company, Tamaqua, Penn.; 300 horse-power to Meriden Street Railway Company, Meriden Conn.; two heaters of 500 horse-power to Portland, Ore.; 250 horse-power to Stroudsburg, Penn.; 200 horse-power to Valdosta Electric Light Company, Valdosta, Ga.; 200 horse-power to United States Leather Company, West Virginia; 1,000 horse-power to Jersey City and Bergen Street Railway Company, Jersey City, N. J.; 600 horse-power, Halifax, N. S.; 500 horse-power to Brooklyn Heights Railroad Company, Brooklyn, N. Y., and many others of smaller sizes. This heater is manufactured by the National Pipe Bending Company, of New Haven, Conn.

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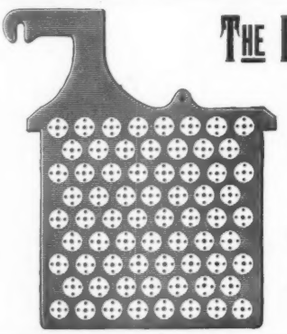

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